HANDBOOK OF PEDIATRICS

ANCILLA TRAGLER
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PREFACE

This handbook is compiled to give guidelines in the management of common pediatric problems. Apart from the resident staff, it will be useful for undergraduates, postgraduates, pediatricians as well as general practitioners.

We are glad to bring out this new revised edition with additional information.

We are thankful to Dr. W. K. Kandoth, Dr. Mrs. A. Fernandez and M. A. Tragler for their valuable suggestions and help.

CONTENTS

Care of the Newborn

General Routine for All Babies:

1. Suction the nose and oropharynx with bulb syringe or catheter. This should be done as soon as possible after the delivery. The baby should be kept below the level of the perineum to prevent loss of blood from the infant into the placenta. About two minute after delivery the cord should be clamped and cut leaving a stump of 4" and the infant placed at once in 15-degree Trendelenburg position in the warmed resuscitator. The infant should be dried well.

2. An evaluation should be made of the infant at 60 seconds and 5 minutes after birth, according to the criteria suggested by Apgar.

The following five objective signs are evaluated and each given a score of 0, 1 or 2. A score of 10 indicates an infant in the best possible condition. (See Table 1)

3. The baby must be kept warm, watched by a delivery room nurse [Rectal temp. 96°-98°F (37-38 C)]. If further care is indicated, she should give the infant oxygen by mask at once, while notifying the

TABLE 1

Score	Heart Rate	Respiratory Effort	Muscle Tone	Reflex irritability (Response to Catheter in Nostril)	Color
0	Absent	Absent	Limp	No response	Blue, pale
1	Slow (below 100)	Slow irregular	Some flexion of extremities.	Grimace	Body pink, Extremities blue
2	Over 100	Good crying	Active motion	Cough or sneeze	Completely pink.

anesthetist, obstetrician or pediatrician of the baby's condition.

4. *Feeding:*

Full-Term Infants:

Nothing by mouth until stable. (8-12 hours)

Water every 4 hours for the next one or two feedings. Then milk feeding.

(a) Breast feeding every 3 or 4 hours thereafter, omitting the 2 a.m. feeding until the fourth night if desired.

Glucose water may be offered after each breast feeding by spoon and cup, until milk comes in. Early introduction of bottle is not recommended as bottle fed babies refuse to suck the breast.)

Supplementary formula not to be offered without good reason—only when prescribed by the doctor.

(b) Feeding with spoon or bottle at 8 or 12 hours and every 4 hours thereafter, unless demand feeding is specifically ordered by the attending pediatrician.

First day—usual formula (20 calories per 30 ml.)

Offer 1/2 ounce (15 ml every) 4 hours for 12 hours, then 1 ounce (30 ml) the next 24 hours, then increase 1/2 ounce every day as tolerated up to 3 ounces (90 ml).

These babies should be fed by their mothers at least twice a day preferably every feeding. Offer water ad lib. if crying between feedings.

5. *Skin Care:*

Bathing upon transfer to the nursery. Gentian Violel or spirit can be used on umbilical stump.

6. *Drugs and Vitamins:*

(a) Indications for antibiotics other than overt infection:

(1) Ruptured membranes with active labour over 12 hours and premature birth.

2. Foul-smelling, discolored or viscid amuiotic fluid and premature birth.

(3) Prolonged or complicated labour and premature birth.

(4) Suspected infection in infant after nose, throat, urine, CSF and blood cultures have been performed.

B. For gonorrheal ophthalmia prophylaxis:

One drop of 1% per cent silver nitrate in each eye, or Penicilin eye drops 1-2 drops in each eye (50.000 units/ml)

C. Vitamins—

1. Vitamin K_1: If mother has received none during labour, infant should be given one dose of 1.0 mg. I. M.

2. Vitamin C

   (a) In full-term infants 50 mg. per day to be begun at 1 or 2 weeks of age.

   (b) In premature infants 50 mg. twice a day to be begun the day after oral feedings have been instituted, continued until an ACD mixture is started at one week of age.

3. Vitamins A and D: One may safely wait until 1 or 2 weeks of age to add these (Multivitamins)

4. If a term infant is receiving a formula with vitamins ir it, added vitamin drops would not be necessary.

5. Vitamin E: If none in formula, give 15 to 25 I.U. daily especially to low birth weight infants.

7. *Humidity:*

   55 to 65 per cent; higher with increased concentrations of oxygen.

8. *Oxygen:*

   (a) All oxygen orders should be left by the pediatrician at concentration desired, not by flow as liters per minute. All nurseries for premature infants must be equipped with an oxygen analyzer in good working order, and should have facilities to measure arterial oxygen tensions.

   (b) The oxygen concentrations in hoods and incubators should be determined hourly by a nurse on the nursery service and recorded on the infant's chart.

9. Nurse's special notes will be initiated promptly by the nursery nurse for all babies, and the physician should be notified for any of the following findings:

   (a) Early jaundice.
   (b) Laboured breathing.
   (c) Suspicion of any infection.
   (d) Elevated or very low temperature
   (e) Cyanosis or pallor.
   (f) Abdominal distension

(g) Poor feeding or failure to take feeds.
(h) Vomiting.
(i) Loose stools.
(j) Excessive crying or hyperactivity.
(k) Twitching or convulsive movements.
(l) Excessive quietness or inactivity.
(m) "Baby doesn't look right".
(n) No stools in twelve hours.
(o) No urine in twenty-four hours.

All babies should have respirations and apical pulse recorded every four hours or more frequently as indicated.

Apical pulse is counted for 1 full minute, using a stethoscope, Respiration must be counted when the infant is asleep or quiet, preferably midway between feedings.

2. Resuscitation of the Newborn:

(1) Keep baby warm and in head low position.
(2) Check Apgar score if score less than 8 at one minute requires active resuscitation.
(3) In mild asphyxia—Apgar 7-8 peripheral stimulation—by flicking heels or 0_2 stream on face, often helps to stimulate respiration

(4) Suction use Dele's trap with nasogastric tube for suction. If secretions are thick then low pressure suction can be used.

(5) Moderate asphyxia Apgar 4-6 or if heart rate less than 100, and respiration still poor then introduce airway and start O_2 through facemask.

(6) If still no improvement use mask and bag (newborn size) 60% oxygen should be used. Pressure should be applied slowly upto 30 c.m. of water in term babies and 40 c.m. of water in preterm babies. The pressure is maintained for 2-3 seconds. This is repeated 4-5 times.

(7) If no improvement with mask and bag or in case of severe asphyxia (Apgar 0-3) endotracheal intubation must be done using an appropriate size tube. (2.5-3mm). It should allow a small air leak, as too tight a tube will cause subglottic stenosis. Intubation must be done aseptically, with the operator wearing sterile gloves from which any powder has been rinsed with sterile water. A sterile towel is placed under the infant's neck. After ventillating with mask and bag for a minute introduce larygnoscope with the left hand at the right corner of the mouth and advance it 2-3 c.m. while rotating it to the midline and pushing

the tongue to the left. When the tip of the blade is between the base of the tongue and the epiglotis a slight elevation will expose the glotis. The endotracheal tube it now introduced until its elbow is stopped by the larynx. If there is difficulty with the proceedure, remove the laryngoscope and ventillate infant again with mask and bag and attempt again in 2 min. (never try for more than 30 sec.) As soon as the endotracheal tube is in place, begin assisted ventilation, while listening over both sides of chest. Care should be taken that tube is not too far down into right main stem bronchus. If endotracheal tube is to be kept in place airway should be suctioned at least every half hour using a sterile suction catheter. The endotrocheal tube should be fixed well in the right position.

(8) Metabolic acidosis—The amount of bicarbonate to be given can be calculated on the formula m. Eq = 0.3 x wt (kg.) x base deficit (m Eq/litre). Iniatally only half of the defecit should be corrected. The sodium bicarbonate should be diluted in 5% Glucose or distilled water and given at the rate of 1 mEq/kg/minute or even more slowly. In case of severe asphyxia Apgar 0-1 at 1 minute or less than 5 at 5 minutes, even before blood

gases are obtained Sodiumbicarbonate may be infused, but probably no more than 5 m Eq/kg. (range 2-5 m. Eq/kg) should be given under these circumstances. No bicarbonate should be given unless ventilation is being assisted.

(9) Insert electro-cardiographic electrodes and monitor heart rate.

(10) Cardiac massage—This is carried out if there is no audible heart beat or no electrical activity. Place your hands around the ir fant's chest with finger tips on the back and thumbs touching over the sternum, quickly press down with them at the rate of 80-100/min. Co-ordinate the heart beat with the ventilation. 3 heart beats pause for breath. It is important to keep infant on firm surface during the proceedure.

(11) Umbilical artery should be catherised for obtaining blood gas samples, and maintaining infusion in case periphereal vein is not being used.

(12) Caloric, and fluid requirement should be maintained. Initially 10% glucose is used 80 100 cc/kg 24 hrs for 1st 48 hrs. Electrolytes are added after infant is 48 hours old taking into account any Sodabicarbonate infused (2-4 m. Eq/kg of Nacl 24 hrs). There is hypocalcemia and hypokalemia

after neonatal asphyxiaj hence after infant has voided 2-3 mEq./Kg. of KCL and 200 mg./kg. of calcium gluconate per 24 hours should be used.

(13) Empty stomach with orogastric tube.

(14) If baby is depressed due to administration of pethidine to the mother give lethidrone (nallorphine) to the baby 0.1 mgm/kg. body wt. intravenously.

3. Infant Feeding

Breast-feeding should always be encouraged. There can be no substitute equally as good. Breast feeding should only be discontinued on doctor's recommendation. Some substitutes for breast milk and their food values are given in Table No. 2.

Artificial milk also can be started as complemantary feed to breast milk.

The quantity will vary to a certain extent with each baby but the following is an approximate guide.

	Approximate feed of milk	
Birth—1 month	2—3 oz.	6—7 times/day.
1 mth—2 mths.	3—4 oz.	6—7 times/day.
2 mths—4 mths.	4—5 oz.	5—6 times/day.
4 mths—6 mths.	6—7 oz.	5 times/day.
Beyond 6 months.	7—8 oz.	4—5 times/day.

TABLE 2

Comparison of some nutrients in various milks/100g

Milk or product	Calories (Kcal)	Protein (g)	Fat (g)	Carbohydrate (g)	Calcium (mg)
Human milk	71	1.2	3.8	7.0	33
Cow's milk	69	3.3	3.7	4.8	125
Buffalo's milk	102	3.8	7.5	4.9	200
Dried skimmed milk	357	36.0	1.0	51.0	1260
Dried whole milk	500	25.5	27.5	37.5	900

Buffaloes and cows milk should be diluted ni the first 4-5 months of life. It should be boiled well and 1 tsp. of sugar should be added to 4 oz. of milk.

Some important factors to be considered for successful artificial feeding.

(1) Facility for boiling and sterilizing. All articles should be boiled before use. Milton's solution can also be used to sterlise articles. Bottle and nipple should be washed well. Cup and a spoon is more advantageous as washing is easier.
(2) Adequate washing facilities.
(3) Good source of water.
(4) Reliable milk supply.
(5) Good knowledge about infant feeding.
(6) Sufficient money.
(7) Time to prepare feeds.

Weaning:

Breast feeding should be carried out as long as possible. But after the age of 3-4 months most mothers will not have enough milk to be the only source of food for the infant, and so some other foods will have to be added. Table No. 3 is given as a rough guide as to when various foods should be added during the first year of life.

TABLE 3—**Supplementary Food**

	Cereals	Pulses	Fruits	Vegetables	Mutton, Fish, Eggs.
1 to 3 mths.	—	—	Applejuice, Sweet Lime Orange grape juice.	Tomato soups.	—
3—5 mths.	Thick rice, Kanji, popcorn flour, ragi-nachni, farex, nestum, balamul lactogen, cereal.		Mashed banana, Papayo, Chikoo, Mango.	Vegetable soup.	Mutton soup.
5—9 mths.	Rava kheer, biscuits, bread (softened).	Dal, water	Fruits.	Mashed vegetables, Potato.	Eggs-yellow.
9 mths—1 yr.	Soft rice, soft khichdi, bread, toast, chapati (softened).	Dal	Fruits.	Mashed vegetables.	Minced meat, fish (pomphret with peeling of skin of fish,) egg white.
After 1 year — give full diet.			Multi vitamin & Iron also may be given-especially to prematures		

Soups and juices are only given if economicaly feasible.

Cereal can be prepared at home by using flour (atta) or ground rice, ragi, millet etc. A porridge is prepared of this by cooking well in water and addition of little milk, sugar and oil or ghee. Quantity is gradually increased from a teaspoon to about 1/2 cup in 4-6 weeks.

4. Infant & Child Care:

Mothers should be advised to take their child to an under—Five Clinic from the neonatal period.

The clinic should have special emphasis on growth and development, immunisation, nutrition, health education and family planning. The 'Road to Health Chart' is very good means of maintaining a child's health record. It's best to have patient retained health cards. Special care should be given to 'At Risk' infant.

Some of these factors are—(At Risk Infant)

(1) Prematures and Low birth weights.
(2) Twin deliveries.
(3) Illness in mother.
(4) Visible congenital anomalies.
(5) Poor weight gain, especially in the first six months or life: Wt gain less than .5 kg/month in 1st 3 months or .25 kg/month in 2nd 3 months. The growth chart also helps to detect poor weight gain.

(6) Death of a parent especially mother.
(7) Birth order over seven.
(8) Cessation of breast feeding.
(9) An episode of measles, whooping cough and severe or repeated diarrhoea in early months of life.
(10) A history of previous child with malnutrition.
(11) Children of sterilised parents should also receive special care.

Screening tests for visual acuity & hearing and a dental checkup must be done before a child enters school.

It is advisable to check Hb and urine and stool also during this period.

Recommended Schedule of Immunisation:

Age	*Vaccination*
Birth	Small-pox B.C.G.
3rd—9 months.	Triple and Oral Polio. 3 doses at interval of 6-8 weeks.
9—10 months	Measles Vaccine.
1 ½—2 Years.	1st Booster of Triple and Polio.
4-5 years.	2nd Booster of Triple and Polio.

Thereafter D.T. (Tetanus Diptheria) every ten years. T.T. should be done after 5 years (school age) and

B.C.G. repeated if necessary. Smallpox vaccination every 5-10 yrs. and during an epidemics.

Optional:

Typhoid Para Typhoid A.B., Cholera, after age of 1 year should be repeated every 1 year for T.A.B. and 6 months for cholera.

Mumps and Rubella vaccine can be given in 2nd year of life. Rubella vaccine may also be given to girls at adolescence and Influenza vaccine before an expected epidemic.

A careful record of all immunisation given should be made.

5. Management of the Premature and Low Birth Weight Infants

Care of the Premature Infants:

These infants are best managed in a special premature unit.

1. *Temperature control:*
   It is required to maintain a rectal temperature of 37°—38°C. If servo-controlled heating equipment is being used, it is important to adjust the skin probe setting to whatever temperature is required to maintain the desired rectal tempera ture.
2. *Infant handling:*
   This should be minimised as much as possible especially in the very premature infant. Scrupulous

TABLE 4 —Clinical Criteria or Classification of Low Birth Weight Infants

Criteria	36 weeks (Premature)	37–38 weeks (Borderline Premature	39 Weeks (Full Term)
Creases on sole of foot.	One or two transverse creases running anteriorly, smooth posterior 3/4 of foot.	More creases appear anteriorly, heel remains smooth.	Creases extend throughout soles, prominent deep clefts.
Size of breast nodule	Not palpable before 33 wks.; rarely exceeds 3 mm. by 36 wks.	Average is 4 mm.	Average is 7mm., sizeable mass, readily seen.
Hair on head.	Cotton wool quality, difficult to distinguish one strand from another.	Same, with some progression-n toward 38 weeks charac: teristic.	Silky texture because of thickening of hair; can distinguish each strand of hair.
Cartilaginous earlobe.	Shapeless, pliable with little cartilagenous support.		Rigid earlobee stiff-helix and anthelix prominent (distinct ridges).
Testicular descent and scrotal changes.	Small scrotum with rugae on its inferior aspect limited to a small area; testes at junction of inguinal canal and scrotum	Gradual descent with scrotal enlargement.	Enlarged scrotum with fully descended testes, pendulous in appearance; inferior surface of scrotum completely covered with rugae.

* Modified form Usher, R., et al. . Pediat. Clin. N. Amer., 13:835, 1966.

isolation care is mandatory. Hand washing should be done before handling every baby. Gowns requird if baby is handled.

3. *Nutrition and Hydration:*

The feeding of premature infants must be individualized on the basis of the infant's vigor, the quality and quantity of nursing service available and generalizations about his nutritional requirements. During the first week of life the infant's minimal food requirements must be met without exceeding his ability to ingest and retain the food offered. The pediatrician after consultation with the nurse must prescribe in writing the detailed feeding orders:

(a) Technique of feeding: i.e., choice of nipple, indewelling catheter or gavage as indicated by the individual infant's sucking and swallowing ability. This decision is based on the nurse's and physician's estimate of the infant's status.

(b) The interval between feedings must be specified.

(c) The amount of each feeding and subsequent increases are ordered and are illustrated below. A SCHEDULE SUCH AS THIS MUST BE USED AS A BASE FROM WHICH ONE INDIVIDUALIZES THE FEEDING OF EACH INFANT ACCORDING TO HIS ABILITY TO INGEST AND RETAIN THE AMOUNT OFFERED.

GUIDELINES FOR FEEDING

TABLE 5

Weight Feeding interval : Hours of life	1200 Gm q 2 hr. ml/feed	1200–1500 Gm q 2–3 hr ml/feed	1500–2000 Gm q 3–4 hr ml/feed	Type of Feeding
4–8	1–2	2–3	5–15	sterile water x 1
	1–2	2–3	5–15	*D10W x 2
8–12	1–2	2–3	5–15	D10W : formula** 2 : 1
12–24	2–4	4–6	5–15	D10W : formula 1 : 1
24–48	3–6	6–9	10–25	D10W : formula 1 : 1
48–72	4–8	8–12	15–35	D10W : formula 1 : 2
72+	5–10	10–15	20–45	full strength formula.
Increment per feed per day after 72 hrs.	1–2	2–3	5–15	formula

* 10% Dextrose in Water

** Milk Containing 20 cal/oz or expressed breast milk

Infants stabilize on about 100 cal/kg. and do well on 120-150 cal/kg. Formula containing 20 cal/oz or expressed breast milk must be used.

SPECIALIZED FEEDING TECHNIQUES

(Multivitamin and Iron supplementation is recommended. Vitamin E 15-25 IU if none in formulae)

(a) *Gavage Feedings:*

Feedings by means of the nasogastric or orogastric tube are frequently used in infants who cannot take oral feedings for limited periods of time and whose gastrointestinal tract is intact. Infants included in this group are those with CNS depression and poor suck reflexes following delivery, or premature infants less than 32 weeks' gestation whose oral intake initially is limited. A No. 5 or No. 8 French nasogastric tube is inserted through the nose into the stomach prior to each feeding to avoid aspiration. Proper placement of tubing should be checked by aspiration of gastric contents and by injection of air with auscultation for gurgling over the stomach. The formula should run in by gravity and the length of time for feeding should be equal to that allotted to oral feedings of a similar amount. Under no cir-

cumstances should a feeding be injected by syringe. The tube is clamped and withdrawn slowly once the feeding is finished to avoid dripping into the esophagus or oropharynx. With each feeding, a fresh tube is placed, preferable although a No. 5 French tube may be clamped and left in place. The head and shoulder should be raised during and for 1/2 hrs. after feeding.

(b) *Nasojejunal Feedings:*

More recently, the use of nasojejunal feedings, described by Rhea, et al. and Cheek in sick newborns and premature infants, has proved a worthwhile technique. Feedings by this route were initially used to minimize regurgitation and aspiration in infants with neonatal tetanus. As the efficacy of this technique has been documented, the patient population has been expar ded by these investigators to include critically ill infants with pneumonia, meningitis, respiratory distress syndrome, congenital heart disease and other conditions.

Both silicone and polyvinyl nasojejunal tubes have been used successfully. The tube is passed through the infant's nostril into the

stomach allowing for adequate length so that it may past into the duodenum through the pylorus. The infant is then placed on his right side to facilitate passage, and pH is tested at frequent intervals. When the aspirated fluid reaches a pH of 5 to 7, abdominal X-rays are obtained to insure that the catheter tip is at the ligament of Treitz. Once the correct position is attained, feedings at room temperature may begin with 5 percent dextrose followed by half-strength then full-strength formula. Formulas containing 20 to 24-cal/oz have been used with good results, in amounts to supply 150 ml/kg. Both the administration of 10 to 15 ml aliquots every 1½ to 2 hours by slow drip, and continual infusion by pump have proved satisfactory. Care must be taken to avoid overload of fluid infused directly inio the jejumum. A nasogastric tube is placed to check for gastric residual and regurgitation through the pylorus. In order to avoid clogging of the tubes, irrigation with 1 cc of water is done after feedings. The NJ tube has been left in place for as long as 10 ½ weeks without causing problems. Failure to pass the tube into the jejumum is reported in only 2

percent of infants, some of whom had congenital anomalies which made it impossible. No malabsorption or dumping has been noted. Complications reported are minimal but have consisted of plugging of the tube, overload of fluid with aspiration, and very rarely sepsis. Weight gain has been uniformly good. It must be remembered that oral feedings should be instituted as soor as possible, and that the infant should be held and fondled to give stimulation if the condition permits.

(c) *Parenteral fluids:*

The early use of intravenous fluids to maintain hydration and correct abnormalities of metabolism in very low birth weight infants (less than 1500 gms.) has been shown to be associated with improved survival compared with nasogastric fluids or starvation.

Where there is some difficulty or delay in initiating early feedings, all premature infants should have parenteral fluids administered during the first 24 or 48 hours to maintain hydration and supply some calories to limit catabolism. This is usually ac complished by Dextrose 5% or 10% in water through a peri-

pheral vein such as a sclap vein (or the umbilical artery if the artery has been catheterized for monitoring purposes in a sick infant). Some electrolytes are usually added after 24 hours. (1/3 Normal Saline). Oral feeds should be started as soon as possible. Hypoglycemia should be watched on discontinuing I.V.

(d) *Total Parental Nutrition:*

Indications—Surgical lesions like omphalocele, Gastroschisis, complicated anastomosis, short gut, necrotizing entrocolitis of prematurity, intractable nonspecific diarrhoea, premature infants only where feeding are not tolerated.

A surgeon must be consulted for inserting the catheter. Formulas must be available or should be prepared to provide the infant with complete nutrional requirement.

Frequent laboratory investigations should be carried out. Complications like sepsis, thrombosis, improper placement, and metabolic acidosis can be very grave.

(e) *Nipple feeding:*

The transition from gavage feeding to nipple feeding should be made gradually. A trial of nipple feeding is indicated when the infant

begins to suck on the gavage tube. His ability to suck and swallow will depend more on his maturity than on his weight but by about 32-33 weeks (about 1500 gm) he should be able to take one or two feeds (held in the incubator) daily. By 34-35 weeks (about 1700 gm) he can be fully on the bottle and can be removed from the incubator for feeding.

(f) *Dropper feeding (Breck):*

This technique is not recommended for the small premature infant who may have difficulty with swallowing but should be limited to infants who need special help with sucking e.g. cleft palate, mouth ulcers etc.

4. *Other problems of prematures should be looked for and treated:*

Respiratory Distress syndrome, metabolic problems like hypoglycemia, hypocalcemia, metabolic acidosis, electrolite balance; apnoeic spells, Patent Ductus Arteriosus anaemia, infection and necrotising entrocolitis and hyper-bilirubinemia.

5. *Discharge Home:*

Prematures are usually discharged when they are being fed well enough by bottle given by the mother to gain weight normally on a four

hourly schedule, or gaining weight well on breast feeding. In most instances this is at 36-37 weeks G.A. and body weight of 2.2-2.5 kg.

MANAGEMENT OF INTRA UTERINE GROWTH RETARDATION (I.U.G.R.)

Evalution can start in utero:

Subnormal maternal weight gain or uterine growth, signs of foetal distress, falling maternal urinary estriol level, may be helpful. Ultrasonic cephalometry also has been proved very helpful in this respect.

At birth:

If the correct gestational age is known the presence of I.U.G.R. can be ascertained; otherwise clinical criteria like soft tissue wasting with loose skin, scaphoid abdomen, dry peeling cracked skin, widened skull sutures, meconeum stained umblical cord may be seen.

Treatment:

The best treatment is prevention by avoiding factors which cause I.U.G.R. Next is early detection of I.U.G.R. and taking the necessary treatment. Good management during labour and delivery is essential. Soon after birth, look for and treat problem like respiratory distress, metabolic acidosis, hypoglycemia

congenital anomolies and sepsis. Feeding should start early (2-4 hrs after birth).

6 Idiopathic Respiratory Distress Syndrome
(Hyaline Maline Membrane Disease)

I. *Criteria for Diagnosis*—Respiratory Difficulty

1. Respiratory rate over 60.
2. Inspiratory retractions.
3. Cyanosis in room air, beginning before and persisting beyond six hours of age, associated with typical X-ray findings, (reticulogranular pattern accompanied by an air bronchogram extending beyond the cardiac borders), in the absence of a specific etioloty. (e.g. CHD surgical conditions, meconium aspiration, etc.).

II. *General Care:*

1. Infant should be placed in an Incubator prewarmed to a temperature of 90-94 F, with a relative humidity of 95-100%.
2. Excessive manipulation and exposure to cold stress should be avoided.
3. Infant's temperature should be stabilized between 96-98 F. rectal. (37-38°C)

III. *Respiratory Distress Work Sheet:*

Should be initiated and maintained.

IV. *Oxygen:*

Should be warmed and humidified, and the aim is to achieve the Pa02 about 50-70 mm Hg, so it is necessary to check frequently the ambient 02 concentration and arterial PO2, especially during the first 12 hours.

V. I.V. 10% Glucose 80-100 c.c/kg 1st 48 hours, after that 1/4 Normal saline and Glucose. Potassium and Calcium should be added. Electrolites, Ca, K, should be measured every 3 days. Oral feeding should be attempted only after third day by intermittent or continuous gavage.

VI. *Umbilical Artery Catheterization:*

Should be done in all sick infants (Silverman's score of 5-10) for adequate monitoring of acid-base status and PO2 (pH and PC02/can be monitored with arterialized capillary blood). If a peripheral vein is impossible to get for IV fluids, these can be administered through the umbilical artery, and in the last instance through the umbilical vein.

VII. *Blood Studies:*

1. Arterial blood gases.
2. Hgb. & Hct. & Platelet count.
3. Glucose.
4. Electrolytes and Ca and Phosphate

VIII. *Correct metabolic acidosis depending on base deficit*

IX. *Consider Transfusion if Hb below* 13 *gm.*

X. *Antibiotics* (*associated Pneumonia, catheter etc.*)

XI. *Management of Hyperbilirubinemia with phototherapy and exchange transfusion.*

XII. *Maintain respiration and care of airway and pulmonary toilet.*

Indication for assisted ventilation:

1. PaO2 less than 50 mm of Hg.
2. PCo_2 more than 70 mm of Hg.
3. Cyanosis in 100% Oxygen.
4. Sustained apnoea.

Some methods used:

1. Mask and bag carried out manually by trained personell. It can be used for short periods or intermitently for 2 O mins. every hour. A tube is placed in infant's stomach to avoid over distension. It's main dis-advantage is the requirment of large number of trained personel.

2. *Respirators:*

(a) Volume cycled respirator—These are generally preferred, they deliver a preset volume. The advantage of a fixed volume respirator is that it will deliver the volume irrespective of changes in compliance and resistance.

(b) Pressure-cycled ventillators operate by termination of the inspiratory phase when a predetermined pressure is reached. Negative pressure respirators are sometimes prefered because it excludes the need of intubation, however it is usually unsatisfactory in small infants.

(c) Time-cycled respirators (Baby bird respirator)—In this type both inspiratory and expiratory time can be independantly adjusted. It provides unobstructed flow to spontaneous inspiration and is therefore suited for intermandatory ventilation in which respirator augments some fraction of patients spontaneous inspiration.

III. *Continuous Transpulmonary pressure:*

Various terminology Continuous Positive AIRWAY Pressure (CPAP), continuous negative AIRWAY. Pressure (CNP), Positive END Expiratory Pressure (PEEP). In all cases it is a positive gradient between

airway, pressure and intrapleural pressure maintained through out the respiratory cycle. This technique is helpful early in the disease, and it may prevent the use of mechanical ventillators. It can also be coupled with assisted ventilations. Major disadvantage is right heart failure and reduced cardiac output.

XIV. Observe for and treat complications like Disseminated intravascular coagulation, pneumothorax, pneumomediastinum, Retrolental fibroplasia, C.N.S. haemorrage, subglottic stenosis, laryngomalacia, chronic lung disease and Patent Ductus Arteriosus with heart failure.

7 Neonatal hyperbilirubinemia

Investigations:

Hb
C B C
Retic. count
Peripheral smear 1. Normoblasts
2. Spherocytes

Blood grouping and Rh of baby and mother.

Comb's test 1. Baby 2. Mother
Cord bilirubin 1. Direct. 2. Indirect.
S. Bilirubin

If Reqd:

SGPT—G6PD—VDRL

Australin antigen, Viral studies.

Urine test for cytomegalic inclusion body, toxoplasmosis

Abnormal Hemoglobin.

Blood culture.

Treatments used

1. Photo therapy.
2. Phenobarbitone 4 mg/kg/day.
3. Agar. agar 250 mg. TDS orally may be given
4. Steriods 2 m.g/kg. day

Maintain good hydration.

Exchange transfusion

Fresh plain blood transfusion—10 cc/kg.

Antibiotics if necessary

Indications for phototherapy:

1. Full term baby—Indirect bilirubin more than 12 mg% after 1st 24 hrs.
2. Premature baby-Indirect bilirubin more than. 9 mg% after 1st 24 hrs.
3. Jaundice in the 1st 24 hours of life. Indirect bilirubin 5-9 mg.

Bilirubin and Hemoglobin should be monitered every 8 hours to 12 hours.

Indications of exchange transfusion:

1. Cord blood Hb less than 14 mg% and indirect bilirubin more than 4 mg%
2. Rise of indirect bilirubin more than 0.5 mg/hr. (10-14 mg. in 1st 24 hours, 15-19 mg% in 24-48 hours.)
3. Indirect bilirubin more than 20 mg% in full term baby. Depending on prematurity exchange may be indicated at lower level of bilirubin in prematures (15-18 mg.)

8 Technique of Exchange Transfusion

1. *Decision*—consult with senior physician and inform registrar.
2. *Permission:* always obtain signed permission from a parent before performing this procedure.
3. *Blood bank:* Consult with the staff of the blood bank and obtain fresh heparinized blood if possible (Citrated blood otherwise) Donor cells must be compatible with the baby and must cross-match with the mother's serum. Fresh blood must be used.

For Rh disease:

Baby	*Donor*
O	O neg.
A	A neg. or O neg. (low titer.)
B	B neg. or O neg. (low titer)
AB	AB or O neg (low titer)

For ABO disease:

Baby	*Donor*
A,B or AB pos	O pos (low titer if possible)
A,B or AB neg.	O neg. (low titer)

For other types of jaundice:

Give blood of same ABO and Rh as infant, or O (low titer if possible) with same Rh as baby.

4. Consider use of salt poor albumin 1 Gm/Kg. (available as 25% solution). Give 1/2-1 hour before exchange through umbilical catheter.
5. Empty infant's stomach and make him comfortable on operating table with suitable restraints.
6. Make arrangements for warmth (e.g. Heating pad or overhead heater) and continuous monitoring of heart action. A medical or nursing assistant who can watch the baby closely and keep a record should be available throughout the procedure.

7. Have immediately available:
   Resuscitation equipment-laryngoscope, endotracheal tubes, oxygen.
   Suction tubes, Flushing fluid (Heparin-saline Solution-250 units Heparin in 250 c.c. saline)
8. Carry out scrupulous wash, use gown and gloves.
9. Perpare umbilicus and surrounding skin with tinct. Benzalkonium chloride (zephiron) Iodine, or Spirit.
10. Drape infant to provide adequate sterile working area around umbilicus.
11. Cut umbilical cord to less than. 5 mm. from skin surface and locate umbilical vein. Remove any clots that are visible. Assemble exchange transfusion kit and insert filled polythylene catheter with aspetic technique to 7-8 cm. (term infant) when free flow of blood should be obtained. Never insert open ended catheter—it must contain fluid, (e.g. flushing solution or donor blood) be free of bubbles, and be attached to syringe or three-way stopcock system—this will eliminate the risk of air embolus. Do not infuse if there is no free flow of blood on withdrawal.
12. Measure venous pressure and begin exchange using 10 ml. or 20 ml. volumes according to the size of the

infant. Pre-exchange samples should be obtained for Hb. Hct and bilirubin. When measuring venous pressure, again take great care to prevent air embolization through the umbilical catheter. If the baby chokes or coughs a negative pressure may cause fatal suction of air into the circulation.

13. A two-volume exchange is usually indicated i.e. twice blood volume of 85 ml/Kg. (170ml/Kg.)
14. An accurate record must be kept by the assistant of all blood in and out. The operator and assistant should not become distracted by visitors and conversation—a high degree of vigilance is necessary throughout.
15. At intervals the donor blood should be gently mixed to maintain cells in even suspension.
16. Obtain final samples for post-exchange Hb, P.C.V. and bilirubin. Obtain a blood culture.
17. Check final venous pressure. If normal a final "bonus" of 10-15 ml. of blood can be given.
18. Give 10 mg. Protamine sulfate to counteract the heparin.
19. Remove the catheter—leaving it in place in the expectation of another exchange will invite sepsis.
20. There is no indication for routine antibiotics.

21. Check bilirubin 4-6 hours after the exchange and subsequently as indicated.

Notes:

(1) The total duration of the procedure should not exceed 1 to 2 hrs.

(2) The transfusion should be interrupted if:
   (a) Infant unduly restless or in obvious discomfort.
   (b) Alteration in heart action—tachycardia, bradycardia, arrhythmia.
   (c) Respiratory difficulty or cyanosis.
   (d) Vomiting.

(3) If Acid citrate dextrose blood is used then 1 ml. 10% calcium gluconate should be infused slowly (monitoring the heart rate) for each 100 ml. exchanged.

Subsequent Management:

Following treatment of hyperbilirubinemia the infants with Rh hemolytic disease should be followed closely during the early weeks of life. A certain amount of hemolysis will continue and anemia may become a problem at 4-8 weeks of life. A "top-up" transfusion will be required if Hb level falls below 6 gm%.

Hematinics are unnecessary and should not be prescribed.

9 Common Infectious Diseases:

Measles:

Most patients can be treated at home with general nursing care, maintainance of fluid and diet requirement. Hospital admission required for complications like—(1) Dyspnoeca, (2) Severe diarrhoea or dysentry, (3) Soreness of mouth interfering with feeding, (4) Later complication of malnutrition, tuberculosis.

In the hospital—(1) Proper management of fluid and electrolites.

(2) Maintainence of calories. Breast feeding should be continued.

(3) Treatment of diarrhoea and dysentry.

(4) Antibiotics for bacterial complication like Otitis media, pneumonia etc.

(5) Early diagnosis and management of T.B.

(6) Good follow-up is very essential during the next year to prevent complication especially malnutrition.

Polio:

There is no specific treatment. Good nursing care, complete bed rest, relief of muscle spasms with hot

moist packs, physiotherapy are advocated. Neurological complications should be especially watched for. Tracheostomy and Respiratory support may be required.

Whooping cough:

(1) Good nursing and care by mother especially with regard to maintaining nutrition and fluid requirement. If child vomits mother should be advised to slowly refeed child, severe cases require hospitalisation.

(2) Antibiotics are only helpful in the 1st week of illness. Chloramphenicol 50 mg/kg., or Erythromycin 100 mg/kg. may be used.

(3) Gentle repeated aspiration and oxygen therapy in severe cases of spasms and choking attacks.

(4) Treatment of complications like convulsions, cardiac failure, atelectasis etc.

Diptheria:

An early diagnosis is very essential for proper treatment. A good swab should be taken from the site of the membrane and sent for culture immediately. If clinically diptheria is diagnosed, treatment may be started while awaiting results.

Treatment—(1) General Bed rest—good nursing care of maintainces of hydration and nutrition.

(2) Antitoxin therapy—

This should be administered as early as possible after testing for hypersenstivity by skin or conjunctival test. The dosage varies from 10-20,000 in the anterior nasal type, 20-40,000 units in the pharyngeal type and Laryngeal types and 40-60,000 in combined types and late cases. It is usually given by I.V.

(3) Antibacterial—Penicillin is the drug of choice. Inj. Procaine Penicillin 4-600,000 units daily. It can also be given oraly. Erythromin 100mg/kg. can also be given.

(4) Treatment of complications—

Special care for complication like laryngeal diptheria (might require tracheostomy), myocarditis and neuritis. Respiratory support may be required for respiratory failure.

Tetanus:

(1) Good nursing care.

(2) Antibiotics—Pencillin 4-600,000 units I.M. daily.

(3) Controls of spasm. Various drugs have been used singly or in combination. Good results are obtained with Diazepan, Chlopromazine, Meprobromate and Phenobarbiturate. Larger than usual doses are used.

Dose: Chlorpromazine 4-6 m.g/kg. every e4-6 hr New borns. ,, 10-20 ,, ,, ,, Older child.

Diazepam 1-2 m.g./kg. can be repeated every 3-4 hrs.

Meprobromate 75-100 mg. can be repeted every 3-4 hrs.

Assisted Ventilation may be required

(4) Neutralisation of toxin Anti Tetanus Serum is given after testing for hypersensitivity. 10-20,000 units are given in one dose in 200C.C. of 5% glucose I.M.

Human Tetanus Immune Globulin if available can also be given.

(5) Betamethasone given parentally is also beneficial (in non-neonatal cases).

10 Prolonged Fever:

Temperature must be recorded for a few days.

Investigations:

C.B.C.

E.S.R., C. Reactive Protein.

T.T.

Urine Routine, Culture Antibiotic Sensitivity.

B.U.N., I.V.P. if necessary.

Stool—routine, culture.

X-ray chest, Blood culture, Blood smear for malarial parasites. Widal test, Clot culture, Rheumatoid Factor Test. Bone Marrow.

Lupus Erythematous Cell phenomena, Antinuclear Factor, Antistreptolysin titre, Antistreptokiase titre.

Paul Bunnel test, Weil Felix, V.D.R.L.

Lumbar puncture.

Liver scan, Brain Scan, E.E.G. if necessary.

(Brain abscess).

Treatment—depending on cause

(I) Treatment in Typhoid

Chloromycetin 100 mg/kg/day-6 hrly, doses.

for 10 days (25 mg/kg. infants) can be given orally or parentally.

Resistant cases—Ampicillin 100-200 mg./kg. day in 4 doses.

(II) Treatment of amoebiasis: Flagyl 50 mg/kg/day in 2-3 divided doses. In older children 750 mg. t.d.s. for 5-10 days. In severe cases addition of Emetine 1 mg/kg x 10 days. Or Dihydroemetine 2 mg/kg.

(III) Treatment in Malaria.

Dosage in Mg. base (Chloroquine and amodiaquine) see Table.

To prevent relapses of Malaria (Vivax)

—Primaquine for 14 days—daily 2.5 mg. base (1-3 yrs). 5 mg. 4-6 yrs. and 15 mg. older children.

In drug resistance use quinine. Long acting sulpha—Pyrimethamine also can be used.

TABLE VI

Drugs	Schedule	1-3 yrs.	3-6 yrs.	7-12 yrs.	Older Children
Chloroquine	Day 1	75 mg.	150 mg.	150 mg.	300 mg.
or					
Amodiquine	6 hrs. later	75 mg.	150 mg.	150 mg.	300 mg.
	6 hrs.later	75 mg.	75 mg.	150 mg.	300 mg.
	Day 2	75 mg.	75 mg.	105 mg.	150 mg. (bd)
	Day 3	75 mg	75 mg	150 mg	150 mg.(b.d)
Quinine	Daily for 10 days	410 mg.	666 mg.	1000 mg.	2000 mg

Dose: Administered in mg. of active base. (Chloroquine 1 tablet of 250 mg. contains 150 mg. of active base.)

11 Pyogenic Meningitis

Investigations:

—Urgent L.P.

Proteins
Cell count
Smear-gram stain
Culture and Antibiotic Sensitivity (ABS)
Sugar,

Repeat L.P. after 48 to 72 hours.

Later if patient does not improve.

T.T.

C.B.C. with E.S.R.

E.N.T. check up for focus of infection.

Smear and culture from obvious source; also Blood culture.

Fundoscopy.

X-ray skull-SOS, Electrolytes, Blood sugar, BUN if necessary.

Treatment in ward:

In neonatal period

Antibiotics:

I. Combination of Penicillin with aminoglycoside antibiotic is a good choice till culture results are known.

(1) *Inj. Crystalline Penicillin:*

1st week—50,000 units/kg in 2 divided doses I.M. or I.V. After 1st week—50-75000 units/kg. in 3 divided doses I.M. or I.V.

(2) *Inj. Ampicillin:*

1st week—100 mg/kg in 2 divided doses I.M. or I.V. After 1st week 200 mg. kg in 3 divided doses I.M. or I.V.

(3) *Inj. Kanamycin:*

15 mg/kg/day in 2 divided doses I.M.

(4) *Inj. Gentimycin:*

1st week 5 mg/kg in 2 doses I.M.
After 1st week 7.5 mg/kg. in 3 doses I.M.

In older children:

(1) I.V. Crystalline Penicillin 100-200,000 units kg. daily in 4 divided doses.

(2) I.V. Chloromycetin 100 m.g/kg/day in 4 doses.

(3) I.V. Ampicillin 300 m.g./kg/day in 4 doses.

Later antibiotics according to culture report.

II. Treat raised intracranial tension or cerebral oedemia with Manitol 7 c.c./kg/day for 3-7 days (20%). Dexamethasone .04 m.g./kg. also can be used

III. Anticonvulsant therapy.

IV. Look for and treat other complications, Subdural effusion, metabolic problems like electrolite disturbances, hypoglycemia and hydrocephalus.

V. *Follow up:* Lumbar puncture should be repeated after 48 hours, if patient is not improving clinicaly, also at the end of parental therapy (10-14 days). Parental antibiotics must only be discontinued when L.P. is normal (atleast 10-14 days). Patient can be discharged on oral antibiotics for about one week. Prolonged treatment (4-6 weeks) may be required for enteric bacilli and pseuodomonas.

VI. Steriods are only rarely required. (menigococal meningitis with Water-House Fredrickson syndrome).

12 Tuberculosis

Inv.

C. B. C, Urine T. T. 1: 1000, 1: 100, X-ray Chest, E.S.R., Pleural, Ascitic, Tapping, Bronchoscopy, Sputum Culture Lymphnode biopsy, L.P., X-ray Skull.

No. I Therapy

Isonex 10-20 mg./kg and P.A.S. 200 mg/kg/1-r-18 months. or Thiacetazone 5 mg/kg.

Indications:

(1) Primary complex
(2) Positive Tuberculin test below age 4 yrs. (no B. C. G.)
(3) Primary complex with hilar glands.
(4) Pleural effusion.
(5) Adolescent symptomatic with only strongly + ve T.T. and raised E.S.R.

In No. 1 and No. 2 Isonex only can be used

No. II Therapy

(1) Inj. Streptomycin 20-30 mg/kg—60 Inj.
(2) Isonex 20 mg/kg—1 yr. to 18 mths.
(3) P.A.S. (on stopping Inj. strept.)—1 yr-18 mths 200 mg/kg. or Thiacetazone 5 mg/kg.

Indications:

(1) Endobronchial T.B. (Segmental lesion)
(2) Progressive primary complex.
(Enlarged paratracheals, consolidation etc.)..
(3) Abdominal T.B.
(4) Primary complex in a patient with severe malnutrition, chronic diseases, recent history of infectious disease like measles, whooping cough etc. and patients on steriod therapy.
(5) T.B. Cervical lymphadenopathy.

No. III Therapy

(1) Inj. Streptomycin 30-40 mg./kg. 90 Inj.
(2) Isonex 30 mg./kg.—18 months—2yrs.
(3) Ethambutol 25 mg./kg.—1st 6 wks. then 15 mg/kg. next 6 wks.—then P.A.S. 200 mg/kg for 18 mths 2 yrs or Thioacetazone 5 mg/kg./2 yrs.

Indications:

(1) T.B. Bronchopneumonia, massive pneumonia.
(2) Cavitating pulmonary T.B. (Adult type)
(3) T. B. Meningitis.
(4) Miliary T.B.
(5) T. B. of Bone and joints.
(6) Genito-Urinary tract T.B.
(7) Disseminated T.B.
(8) Massive Lymphadenopathy.

No. IV Steroid Therapy

Introduction:

(1) T. B. Meningitis.
(2) Miliary T.B.
(3) Endobronchial T.B.
(4) Abdominal T.B. (adhesive type)

No. V Prophylactic Isonex

7-10 mg/kg. 9 mths. to 1 year.

(1) Strongly + ve T.T. more than 18 mm. with no other evidence of T.B. (in a child more than 4 yrs. old).
(2) Newborn with History of T.B. in mother (being treated).
(3) Contact with T.B. and no evidence of T.B. (till contact is broken).
(4) Phlyccin, Lupus Vulgaris.
(5) Accelerated B.C.G. and no other evidence of T.B.
(6) Recent conversion to + ve T.T.
(7) T.T. + ve children who develop malnutrition measles etc.

No. VI Resistant T.B.

Drugs-Isonex 30-40 mg/kg., Streptomycin—40 mg./kg. Ethambutol 25 mg./kg./Ist 3 months then 15 mg/kg., next 3 months Rifampin 10 mg/kg. Thioacetazone—5 mg/kg. Cycloserine Pyrazinamide, Kanamycin can also be used.

No. VII. Surgical Intervention

(1) Endobronchial T.B. with segmental lesion.
(2) Bronchiectasis and fibrosis etc.
(3) Bone and joint T.B.
(4) Lymphadenopathy when skin adherant to glands or formation of abscess etc.

(5) Abdominal T.B. with int. obstruction.
(6) Neurological complications like hydrocephalus, paraplegia etc.

All patients should have E.S.R. and X-ray chest done at regular intervals to evaluate progress together with clinical evaluation.

13. Asthmatic Bronchitis

(1) *History:* Detailed history regarding duration, frequency and severity of asthma; also history of what medications have been taken before.

(2) *Physical examination:* to judge the severity of asthma together with any associated problems like dehydration, pneumonitis etc.

(3) *Lab. Investigations:*

(a) C.B.C.—especially for eosinophilia.
(b) Urine routine.
(c) T.T.
(d) X-ray chest.

If necessary:

(a) Serum Electrolytes.
(b) Blood Gases.
(c) Respiratory function test F.E.V_1 /F.V.C. ratio.
(d) Skin testing with suspected allergens.

(4) *Management of acute attack:*

Out Patient:

(1) Inj. Adrenaline 1: 1000 S.C.—.01 ml/kg. Dose not to exceed .3 ml. Can be repeated every 15-20 mins. Dose should not be repeated if there is tachy-cardia of 180-200/per min. If patient is not wheeze free—he should be admitted.

Flow sheet:

Time	Dose of adrenaline	Pulse	Resp. rate	Wheezing.

(2) Patient is sent home on oral medications—

(a) Bronchodilators like Ephedrine 2mg/kg/day or Theophylline 10-15 kg/day—in 3 divided doses Salbutamol available as Aerosol available 2 puffs per dose every 4 hours also orally in tablets or syrup. (2.5-5 mg. per dose)

(b) Expectorants.

(a) Antibiotics like Penicillin or Erythromycin in presence of a pneumonia.

(d) Anti helminthics for worm infestation.

(e) Tropical eosinophilia treated with Diethyl Carbmazine 6 mg/kg 7-10 days.

(f) A short course of steriods may be given if patient has been treated in last 12 months with steroids or if there is no improvement in twelve hours. 5-10 mg. of prednisone daily is usually enough; not more than 4-5 days.

Admission:

(a) *Hydration*—Maintain fluid and electrolyte balance.

(b) *Bronchodilators*—

Orciprenaline .25—.5 c.c. in glucose drip. followed by oral medication.

(c) Aminophylline 3-5 mg/kg. over 5-30 min. every 6 hours, Side effects are headache, palpitation, dizziness, vomiting, hypotension, chest pain, coffee ground vomiting.

Salbutamol can also be given I.V. or in Aerosol.

If patient is known severe asthmatic 1-2 c.c. of Dexameksone may also be added to the drip or 50-100 mg. of hydrocortisone every 6 hours I.V. Therepeutic effect seen in 12 hours.

Other indication for steroid therapy—

(1) Corticosteriod have been used in previous 12 months.

(2) No significant improvement in 12 hours or patient is getting worse.

If steroids given less than 5 days—there is no need to taper dose.

(c) Expectorants—Iodides are found to be helpful in some patients.

(d) Postural drainage—most effective after bronchodilator drugs have been administered-especially useful where excessive mucous is a problem.

(e) Antibiotics when infection suspected.

(f) Oxygen in mild case 30-40% for short duration. 02 should be monitored for more severe asthmatic as cyanosis is not a reliable sign and cannot be detected unless Po_2 is less than 50 m.m. Hg. O_2 is administered via nasal cannula, masks, for infants head box or incubator.

(g) *Alkanization*—

Only indicated for metabolic acidosis. Half of base deficit is corrected and blood gases are repeated. Bicarbonate should only be administered as a buffer in an open system i.e. when Co_2 generated can be removed.

(h) Management of respiratory failure. Criteria for diagnosis—

(1) Disturbances in consciousness.
(2) Incoherent or depressed behaviour.
(3) Increasing pulse and respiratory rate or sudden slow irregular breathing.
(4) Decreasing breath sounds or wheeze.
(5) Cyanosis inspite of 100% O_2.
(6) Increasing hypoxemia (PO2 less than 60 m.m. Hg.) or increasing Hypercaprea. (PCO_2 over 60 m.m. Hg.) Patient should be started on mechanical ventilation.

GUIDELINE TO MECHANICAL VENTILATION

This should be done by skilled personnel, nurses, pulmonary technicians, and doctors.

(1) First intubated—initally oral then naso-endotracheal. The size and length of the tube are very important. The patient is then connected to a ventilator.

(2) Inflationary pressure in range 30-50 c.m. of water may be required.

Volume cycled ventilator should be used and adjusted to give inspiration time 1 sec, expiration time 2-3 sec. (shortened for younger children).

There should be no end expiration pressure—O_2 initally 100% then slowly decreased depending on Blood Gases. It should be humidified and warmed.

(3) Patient should be sedated well.

(4) Endo tracheal tube and major airways must be cleared by suction by skilled personell.

Bronchial lavage: In severe respiratory failure especially in older children or in case of lung collapse, this proceedure has been recommended Bronchoscopy with lavage of alicots of 10-20 of saline inserted in airways after they have been suctioned. The procedure continued until secretion are no longer viscous. In between positive pressure with 100% oxygen is given. It is also better if these patients go on positive pressure ventilation for 3-4 hours after this proceedure.

Long term therapy:

(a) Enviromental factors that precipitate attacks should be minimised or removed completely. Foods like citrus fruits, nuts, egg, banana, curds, fish are better avoided. Animal dander (dogs, cats), wool, cotton, dust and polluted air are other known precipitants.

(b) Drugs corticosteroids in inhalation form as Betamethasone or Beclomethasone.

2 inhalations 4 times daily (400-800 ugm.)

Oral steroids in short courses are recommended only as acute therapy. If attacks are very frequent, if required for longer period Inj. AC TH or alternate day double dose of minimal steroid requirement can be given (single dose early in morning). Sodium chromoglycate. Dose: 1 capsule 4 times daily—Contents are inhaled. After 1 month if improvement seen it is continued for several months and then discontinued.

(c) Breathing exercise designed to enhance expiratory effort are recommended.
Participation in games where exercise is brief and intermitent also helps.
If necessary salbutamol or Ephedrine can be given before exercise.

(d) *Psycho therapy:* Dual objects in case of child—

(1) Encourage to share burden of disease.

(2) At the same time learn to grapple with his problems. So also parents and siblings should have a balanced approach to patient's problem-neither over protective or neglectful approach.

Any major emotional factors that may be disturbing the household are also detrimental to asthmatic patient.

(e) Hyposensitisation—Case selection is important—should be done both on clinical grounds and skin testing. House dust, mite, pollen, hyposensitization are said to have good results. This should be carried out only in expert hands as the danger of anaphylaxis is always exists.

14. **Acute Bronchiolitis:**

Investigations:

CBC, X-ray chest PA and lateral; Blood Gases, T.T.

Treatment :

(1) Oxygen (humidified).
(2) Inj. Procaine. 400, 000 units IM OD. or Inj. Ampicillin 50-100 mg/kg/day IM or IV (Antibiotics only if bronchopneumonia is not ruled out or in secondary bacterial pneumonia).
(3) Sedation—Inj. Diazepam 0.8-1 mg/kg. if required only.
(4) I.V. Fluids as long as intake orally is insufficient. Deficit therapy + maintainance therapy. Sodabicarb 2.5 cc/kg. of 7.8 per cent solution..
(5) Antipyretics.

(6) Digitalisation and corticosteroids may be required in severe cases.

15. **Bronchopneumonia:**

Investigations:

(1) C.B.C. with E.S.R.
(2) T.T. 1: 1000, 1:100—if necessary.
(3) X-ray P Chest, Blood culture.

Treatment in wards :

(1) Oxygen.
(2) Inj. Crystalline Penicillin 5-10 lacs 6 hrly.
(3) Inj. Ampicillin 200 mg/kg. in severe cases.
(4) I.V. fluids with sodabicarb (if patient acidotic)
(5) Digitalisation—if necessary.

16 **Acute Rheumatic fever:**

Investigations:

C.B.C., E.S.R.
C.R.P. (C. Reactive Protein.)
Throat swab.
E.C.G.
X-ray chest PA View, lateral view.

ASO titer. Anti streptokinase titre. Blood culture if necessary.

Treatment in wards:

Complete bed rest—duration depending on severity 2 weeks-3 mos. Inj. Procaine. Penicillin or crystalline Penicillin for 10 days. Aspirin 100-120 mg/kg/day for 6 weeks to 2 months depending on Rheumatic activity (clinically, E.S.R.) Start antacid therapy.

Digitalisation, Diuretics, Salt restriction if cardiac failure is present.

Dose of Digitalis:

Total dose—0.04 to 0.08 mg/kg.
Initial dose-½ the total I.M.
Then—1/6th-1/4th twice in the next 24 hours.
Maintainence.
1/3rd to 1/5-of digitalising dose.

Steroids-Indications:

(a) Moderate to severe carditis i.e. with cardiac enlargement or E.C.G. changes.

(b) Refractory cardiac failure.

Dose-2 mg/kg/day 2-6 weeks taper in last week. Start aspirin in last week of tapering steriod.

Follow up-

(1) Fever, (2) Pulse, (3) B.P. (4) Rash, (5) Arthritis, (6) Cardiac findings.

TABLE VII

Table for Therapy and Activity in Rheumatic Fever Markowitz

Arthritis	Carditis (no Cardiomegaly	Sevcre carditis cardiomegaly or CCF
1. Salicilates 100 mg/kg/day	Salicilates 100 mg/kg/day	Prednisone 2 mg/kg/day 2-wks. of 4 wks.
2. In 2nd weeks reduce to 50 mg/kg/day	In 3rd week reduce to 50 mg/kg/day	
3. Continue 3-4 wks.	continue 6-8 wks. change to prednisone if cardiomegaly develops.	Begin salicalates in last week of prednisone continue for 6-12 wks.

Activity.	Arthritis	Mod carditis	Severe carditis
1. Bed rest	2 wks.	6 wks.	3-6 months.
2. Modified activity	after 6-8 wks.	after 6 months	variable.
7. All Activity	—	—	—

Investigations to be done weekly.
Hb. and E.S.R.

Prohylactically Inj. Penidura 6 LA to 12 LA IM every fortnight. Patient may be sent home with continuing bed rest followed by gradual increasing activity. Returns to school 1-3 months. (OR orally Penicillin 250 mg. twice a day for 10-15 yrs.)

17. Acute Gastroenteritis

Investigations: 1) C.B.C. 2) Urine analysis with specific gravity 3) Stool examination with culture if necessary 4) B.U.N., Electrolytes.

Management: It is very important to grade the degree of dehydration by history and clinical examination. The weight of patient should also be taken.

Mild cases can be treated at home.

Glucose-electrolite solution are available in the market. They can also be prepared cheaply at home by adding 3 level Tablespoons of sugar (30–40gm) and 2 level tsp (2.6 gm) of salt to 1 litre of clean water which is boiled and strained. This should be given frequently in small quantities to a child, to give a total of atleast 100 c.c. (3 oz.)/kg. per day. Infant should be fed with a cup and spoon. Breast feeding should be continued. Juice of

orange can be added for potassium and for a nice taste or 1gm. of Potassium Chloride can be added. More severe cases, or if diarrhoea continues child should be hospitalised.

Treatment:

1) Primary solution ½ normal saline 360 ml./m2 body surface/45 min. or 8 ml./min/m2. body surface. If patient has not voided another 120ml./m2 body surface can be given. If no urine output consider acute Renal failure.

2) Once patient has voided use balanced solution–1/3rd normal saline + 40meq. of Potassium 1 litre (2ml. of 15% Kcl/100 ml) + 20meq. of Sodabicarbonate 1 litre (2–3 ml. 7.5% Na Hco3/100ml.) This is given as 1800–3000 ml/m2 body surface in 24 hours depending on grade of dehydration.

3) In hypernatremia correct dehydration very slowly in 24-36 hr. using 1/4 normal saline. Severe hyponatremia (Sodium less than 120 meq.) will require correction with either normal saline or 3% saline (500meq/litre of Sodium). The total deficit in extracellular volume is calculated and half of this corrected.

4) In metabolic acidosis the amount of bicarbonate given is base deficit X wt. in Kg. X distribution factor, usually half is corrected.

About 4–6c.c. of bicarbonate/100c.c. of fluid will be required.

5) Antibiotics are generally not required. Only where underlying problems like malnutrition or in a few suspected cases of bacterial pathogens. Neomycin, Chloromycetin, Ampicillin, Furoxone or Wallamycin may be used.

6) On discharge it is very important to stress on the preventive aspects of diarrhoea especially proper feeding technique.

18. Chronic Abdominal Pain

Investigations:

(1) C.B.C. including smear
(2) Urine routine to rule out infection, renal disease, diabetes, also culture.
(3) Stool—Ova, parasites, occult blood
(4) T.T., X-ray chest, E.S.R.
(5) Bun., Creatinine, plain X-ray abdomen, I.V.P.
(6) Liver function tests, Biopsy.
(7) Ba studies.
(8) Proctoscopy and sigmoidoscopy

(9) Gastric analysis
(10) Liver scan
(11) Detailed history for psychogenic cause.
(12) Urine for porphyrins Serum Amylase
(13) Laprotomy very rarely indicated.
(14) E.E.G.

Treatment depending on cause.

Functional abdominal pain requires parental assurance, family therapy, environmental adjustment etc.

19. Hepatosplenomegaly

Investigation

(1) Blood smear–anaemia–type, other abnormal cells–blasts, atypical lymphocytes, spherocytes, Malaria parasites, Howell jolly bodies etc.

(2) C. B. C.

Leucopenia (typhoid, malaria, T.B. etc.)

Leucocytosis (Infections mononucleosis, infections, haemolytic anaemia)

Reticulocytosis-Haemolytic anaemia

Pancytosis-Polycythemia

(3) Platelet count. Thromobocytopenic purpura leukemia etc.

(4) Routine urine for bilesalts and pigments.
(5) Stool for ova and parasites, occult blood.
(6) T.T., E.S.R., R.F., L.E. factor.
(7) Liver function tests, serum bilirubin–Direct Indirect. Protein Electrophoresis, S.G.P.T., alkaline phosphatase etc.
(8) Blood culture, Widal, V.D.R.L., Paul Bunnel Serofloccculation tests, Abnormal Hb. Electro phoresis, G6 PD, Creative Phosphokiaase estimation.
(9) X-ray bone-long bone skull for Heamolytic anaemia Gauchers, Xray Chest T.B.
(10) Bonemarrow for Leukemia and other malignancies Gauchers, Niemann Pick, kalazar.
(11) Liver biopsy for (1) Cirrhosis (2) Malignancies (3) Amyloid (4) Haemochromatosis (5) Metabolic
(12) Lymphnode Biopsy for T.B., Hodgkin, lymphosarcoma.
(13) Other tests for Portal Hypertension.
    (a) Splenoportogram
    (b) Ascitic Tap, cytology, chemistry culture.
    (c) Ba-swallow
    (d) Proctoscopy
    (e) Inferior venocavogram

Following tests when neccessary, and if possible. Splenic punctures, Kalazar.

Scintillogram spleen, liver, R.B.C. Life span etc.

Radioisotope Rose Bengal tests.
Australian antigen, alpha feto proteins, Urine for aminoacids.
Serum ceruloplasmin level (Wilsons.)
Galactose Tolerance Test, Glucagon test.
Congo Red Test.

20. Anaemia

Investigations

Hb. M.C.V., M.C.H., M.C.H.,C.
W.B.C. (1) TC.
(2) DC
Peripheral smear—for Malarial parasites, type of RBCS and abnormal cells
E.S.R.
T.T.
Reticulocyte count
Stool (1) Ova and parasite
(2) Occult blood
Urine—routine
Blood group and Rh.
After Iron deficiency has been ruled out following Inv: Coomb's test, Sickle cell-screening test, R.B.C. Fragility
Abnormal Hemoglobin study
Bone marrow
Platelet count

Serum Iron
S. Bilirubin, BUN
G6 PD estimation.
Bleeding time
Clotting time
Prothrombin time
R.B.C. Life scan, splenic scan, lead levels, Fehlings tests.

Treatment: Hb. less than 4 gms% ,Blood transfusion (packed cells) 3-10/cc kg. body wt. Lasix 1 mg/kg. may be given

Iron Def. Anaemia

Inj. Imferon:—
Gm. % deficit of Hb. X Wt. in kg. X 3 = mg. of Iron
1 cc of Imferon = 50mg. of iron
1 amp. = 2cc. Imferon = 100mg. of iron
Oral iron therapy should be used preferably

Dosage 6 mg/kg. of elemental iron for at least 2-3 months after Hb. level normal.

Tab. Fersolate 200 mg.=40mg. of elemental iron.

21. Bleeding Disorders.

Investigations.

(1) Blood smear—Rough estimation of platelet count Normal 10–20/H.P.F. (oil); if less get platelet count

done; also look for abnormal cells blasts, fragmented (haemolytic uraemic syndrome)

(2) C.B.C.

(3) Blood culture–lumbar puncture (Meningococci)

(4) Urine-routine-casts, R.B.C.

(5) Stool for occult blood

(6) Bonemarrow to rule out Malignancy

(7) Simple test-like observation of whole blood Clot formation, clot retraction and lysis, Gross defeciency of clotting factors will be detected but less pronounced deficiency like Von Willie Brand, not detected. Abnormal clot retraction is suggestive of platlet dysfuction; lysis of clot formation is seen in patients with circulating fibrolytic activity.

(8) Prothombin Time (II, V, VII, X)

(9) Plasma Thromboplastin (VIII, IX, XI) Time

(10) Bleeding Time Ivy Test.
Inflate sphygmomanometer to 40 m.m. of Hg-make 2 mm. deep nick on forearm. Blood is absorbed by filter paper, Normal range 2–6 minutes, Thromboplastin Generation Test., estimation of factors VIII, IX, will require specialised Laboratory.

(11) Renal function Tests, Liver function tests.

Management:

(1) In clotting factor deficiencies–replacement Therapy is required. In haemophilia-fresh frozen plasma

or cryoprecipitate depending on the amount of bleeding cryoprecipitalte close 25.50 units /kg. repeat even 12 hrs. is neccessary.

(2) Restriction of activity–varies with under lying activity e.g. I.T.P.; intracranial haemorrhages usually occur in 1st month. In haemophilia restriction according to severity.

(3) In dental extraction, surgery they require hospitilisation and special supervision.

(4) Epistaxis–manage with local pressure, application of aqueous epinephrine (1:1000) or anteriornasal packing. Cauterisation contraindicated. Replacement therapy may be required.

(5) Septicemia, meningitis require specific antibiotic therapy.

(6) In Heamolytic uraemic syndrome—Blood transfusion, management of Renal failure Correction of acidosis, fluid and electrolyte imbalance.

(7) In Disseminated intravascular coagulation treatment still controversial: fresh blood Transfusion, Heparin therapy.

22. Malnutrition.

Investigations.

(1) Hb. C.B.C. smear

(2) Urine routine—Rule Out Diabetes, renal disease.

(3) Stool–Ova & parasites culture

(4) T.T., E.S.R., X-ray chest

(5) Serum Protein electrophoresis

(6) Test for malabsorption when neccesary.

(7) Blood sugar, BUN, Liver function test when neccessary. Treatment Record Ht, Wt., U.S., L.S. Head circumference and midarm circumference.

(1) Caloric Intake to be increased to 150–200 cal./kg. of expected normal weight within 1–2 wks.

(2) Protein intake to be increased to 3–4 gm./kg. of expected wt. within 1–2 wks.

(3) Correct other deficiencies like anaemia (Iron B complex) Rickets Scurvy, Vit. A deficiency. Parental therapy may be required initially.

(4) Treat infections and parasitic infestation.

(5) Correct dehydration, acidosis other electrolytic imbalances.

(6) Parent education in nutrition and preventive pediatrics/and Family Planning.

(7) —Follow up.

The initial source of nutrition is preferably liquid milk 1/2 strength-then full strength; gradually change to semisolid and solid foods. Plasma or Blood transfusions might help in severe cases Mild cases can be treated at

home. Importance in diet to be given to locally available cheap and nutritous food.

TABLE VIII

Food VALUES IN g.m. % of EDIBLE PORTION

Food	Protein gms	Fats gms	CHO gms	Calo-ries
1. Milk (bufalloes)	4.0	8.8	5	117
2. Milk (Cow's)	3.0	4	4.4	67
3. Human Milk	1	3.4	7.4	65
4. Rice (uncooked)	6.8	.5	78	345
5. Wheat flour	12.1	1.7	69.4	341
6. Lentil	25.1	.7	59	343
7. Groundnut	25.3	40	26	570
8. Fish (pomfret)	17		1.8	87
9. Meat (Goat)	21	3.6	—	118
10. Egg (Hens)	13.3	13.1	—	173

23. Failure to Thrive (Growth failure)

(1) Record Ht. wt. on growth chart (percentiles) also milestones and dietic history (with caloric intake).

(2) Hb., C.B.C. for anaemia–nutritional, haemolytic malignancies etc.

(3) Urine-routine-infection, diabetes, chronic renal disease, diabetes inspidius.

(4) Stool exam. for ova and parasites–giving rise to malabsorption, anemia, malnutrition eg. Giardiasis amoebiases, Hook worms, also for occult, blood.

(5) E.S.R. T.T. and X-raychest.

(6) Serum Ca, Phovous Alkaline Phosphotase X-raywrist and long bones-signs of Rickets, Scurvy.,

(7) Inv, related to defects in Major Systems
(1) Renal. : I.V.P. micturating cystogram, BUN. Creatinine, Blood pH & bicarbonate. (2) Cardiac E. C. G. X-ray, chest, cardiac catheterisation (3) Castro Intestinal Liver function Tests, Barium studies, Malabsorption tests (4) Respiratory Bronchogram, sweat chloride (5) Haemotological abnormal Hb., Bonemarrow, Coombs (6) Neurological test E.E.G. X-ray skull, Brain scan

(8) Collagen-L.E., Rheumatoid factor Antinuclear factor.

(9) Immunological — Gammaglobulin electrophoresis, skin tests, Lymphnode biopsy

(10) Endocrine—Bone Age, serum cholestrol, P.B.I. T_4 estimation 17 ketosteroids, Blood Glucose, Gonadotrophins, Dexamethasone suppresion tests, Growth hormone estimation.

(11) Metabolic–Liver biopsy, Galactose Tolerance test; Glucagon stimulation test, urine for aminoacids. Bone marrow biospy X-rays.

(12) Genetic-Chromosomal studies, Buccal smear
(13) Skeletal-system X-rays
(14) Social Maternal Deprivation syndrome.

Management depends on cause.

Constitutional-Reassurance of parents

Nutritional Dietic advise.

Infection–appropriate therapy like anti T.B. anti Helminthic, Endocrine deficiencies-replacement-thyroid, steroid, etc. Maternal deprivation counselling.

24. Epilepsy

Investigations:

C B C, T.T.
X-ray skull (1) AP
(2) lateral
L. P. only once.
Fundoscopy
E. E. G.
S. Calcium BUN.
S. phosphorous
Blood sugar
S. Electrolytes Bun.

Treatment—of status epileptieus

Inj. Phenobarbitone 5-6 mg/kg IM
(Maximum single dose of 200 mg)

If convulsion not controlled in 15 minutes, same initial dose is repeated. If convulsions partially controlled—repeat half the above dose (round the clock, every 5—6hrs.)

Or

Inj. Diazepam.

Dose 0.8-1 mg./kg I.V. (not more than 30 mg.) If it is to be given I.V.—then 1st push few cc. of normal saline—if extravasation occurs—it is very sclerosing (Respiratory arrest—might occur with above drugs)

—Oxygen

—I.V. fluids—to maintain hydration.

—General Anaesthesia-rarely indicated.

Treatment of Epilepsy:

Any type of epilepsy—1st phenobarbitone 3 mg/kg/day in divided 2 doses. In Grandmal, psychomotor and mixed seizures, if after 2 weeks, seizures are not controlled, the dose of Phenobarb is increased to 5 mg/kg/day. After 2 weeks if seizures are not controlled, continue Phenobarb and add Dilantin. Dose of Dilantin 3-6 mg/kg/day in two divided doses. Dilantin can be increased up to 7-8 mg/kg/day but not more than 300 mg/day.

Petitmal seizures:

Phenobarb 3 mg/kg/day

If seizures are not controlled, Zarontin 250 mg daily i.e. 1 capsule. If seizures continue, daily add 1 cap. of Zarontin till tolerance is reached (not more than 6 cap./day) Dilantin can be added if motor component of convulsion involves below the neck region Dose 2-3 mg/kg/day

Infantile myoclonic seizures:

—Phenobarb 3 mgs./kg/day.

Corticotrophin or ACTH 5-10 units IM daily for 2 weeks.

—Prednisolone .5 mg/kg/day may be substituted for ACTH.

Education of patients, parents and community:

—Restriction of activities like swimming, cycling riding etc. Duration of anti convulsant therapy is not, predictable. Best indication if E E G is consistently normal. It should be repeated annually 1-2 years after last seizure before decision to stop treatment is taken. Duration of therapy at least 5 years after last seizure.

25. Febrile convulsion

Investigations:

L. P.—once only.

Hb., C. B. C.

TC. DC. T.T.

Screning, X-ray chest if necessary

Serum Calcium, Phosphorous, Electrolytes, BUN. Blood sugar—Initial episode only.

If L.P. is normal—Treat the cause of infection giving rise to fever. Antipyretics—

Tab. Aspirin 60 mg/kg. body wt./day

Phenobarb 5 mg./kg/day in two divided does.

Tepid sponge, ice caps, Inj. Novalgin if temperature is very high. At discharge.—

Phenobarb itone 3 mg/kg/day for 1 week.

Advise—Aspirin 60 mg./kg and Phenobarb 3 mg/kg/day whenever patient gets fever. If convulsions frequent or atypical treat with continuous Phenobarbitone therapy like in epilepsy.

26. Coma

It is very important to obtain a good history and do a good physical examination. Some important clinical signs are—

(1) Temperature increased in infection, heat strokes or a brain lesion where temperature regulation center is affected. Decreased in peripheral circulatory failure.

(2) Respirations increased in central neurogenic (resp-alkalosis), and secondary to metabolic acidosis as seen in diabetes' dehydration uraemia etc. Decreased in Morphine or Barbiturate poisoning.

(3) Blood pressure increased in hypertensive encephalepathy, increased in intracranial tension. Decreased in Diabetic coma, barbiturate poisoning, internal haemorrhage and gram. negative septicaemia.

(4) Other physical signs like external bruises bleeding through the orifices, cynosis icterus odour of breath etc. should also be looked for.

(5) *Neurological sign:*

(a) Meningeal—in meningitis, subarachnoid haemorrhage and poserior fossa tumour.

(b) Eye signs—

Pupils—unilateral fixed and dilated pupil suggests tentorial herniation, may also be seen in focal lesion near IIIrd nerve like carotid artery aneurism.

Irregular pupils unreactive to light imply brainstem damage. Pinpoint pupils are seen

in metabolic coma, opiate and barbiturate poisoning or pontine haemorrage. Bilaterally, fixed dilated pupils if present for more than five minutes imply irreversible brain damage except in cases of poisoning (atropine) and hypothermia.

(c) Fundoscopy especially for papilloedema, haemorhages.

(d) Eye movements (elicited by dolls head maneuver) VI nerve palsy implies increased intracranial tension, meningeal inflammation, neoplastic disease or pontine lesion. IIIrd nerve palsy (eyes point down and out) in advanced tentorial herniation.

Congugate lateral deviation is seen in–

(a) In Unilateral cortical lesion eyes turn towards a destructive lesion and away from irritating lesion.

(b) Pontine lesion–Eyes turn awayfrom the lesion. Conjugate downward deviation implies pineal lesion or hydrocephalus.
Eyes turn down and inward (looking at the nose) in thalamic and upper midbrain lesion (Parinaud's syndrome).

(c) *Motor examination:*
Decerebrate posturing reflects midbrain lesion.
Decorticate posturing reflects lesion in cerebral cortex, internal capsule or thalamus.
Hemiplegia in most instances reflects a contralaterial hemispheral lesion.

(d) Cerebellar signs should also be looked for.

Investigations:

(1) C.B.C. (2) Urine analysis, (3) Blood group and crossmatch. (4) Blood culture, (5) B.U.N., Sugar, Electrolites, Blood gases, Liver function tests, (6) Serum, urine and stomach content for poison analysis. (7) X-ray skull chest and abdomen for injuries. (8) Lumbar puncture, E.E.G., bran scan, arteriorgran and encephalogram.

Management depends on the cause; an urgent consulation with Surgeon and Neurosurgeon may be required. General principle—

(1) Maintain airway and respiration. (2) Treat shock. (3) Maintain fluid, electrolytes and caloric requirements. (4) Maintain skin temperature. (5) Treat raised intracranial tension with Manitol, Dexamethasone, guarded lumbar puncture or ventricular tap. (6) Anti convulsant therapy. (7) Skin care.

27 Worm Infestations

Inv-Stool exam., C. B. C.

(1) Enterobius vermicularies (Thread, pin, seat worm.)

(i) Piperazine Citrate 50 mg/kg/day x 7 day.

(ii) Thiabendazole 50 mg/kg— 2 doses.
1 tablet, 1 tsf.—500 mg.

(iii) Pyrivinum pamoate

(2) Hook worm.

Alcopar 2.5 gm. below 2 yr.

5 gms. above 2 yrs. (1 packet)

Empty stomach—1 hr. before food; 2nd dose only if ova still present in stool. Thiabendazole 50 mg/kg 2 doses.

(3) Round worm.

Piperazine Citrate—75 mg/kg H.S. maximum dose 4 gm. (500 mg/tsp/tablet.)

Thiabendazole—50 mg/kg single dose.

(4) Trichuris trichura

Thiabendazole 50 mg/kg-2 doses.

(6) Trichinosis-Thiabendazole 50 mg/kg 2-7 days.

(7) WuBancrofti — Filariasis

Diethyl carbamazine 2 mg/kg x 2 wks.

(8) Taenia saginata, solium

Nicolsamide (Yomisan) 1 Tab 500 mg. repeat same dose after 1 hr. Mepacrine 500 mg for children

under 6 years Tania solium same as above—500 mg. for children over 6 years.

(9) H. nana same as above

(10) Tropical Eosinophilia

Hetrazan 6 mg/kg/day 7-10 days.

Broad Spectrum Antihelmentic Mebendazode I. B. D. x 3 days.

28. Poisoning

(1) Small quantity of kerosene ingested long time before examination—No stomach wash is necessary only observation

(2) Large amount of kerosene ingested short time before-stomach wash is necessary.

Antibiotics. Inj. Proc. Pen. 4 lacs IM

or Inj. Cryst. Pen. 5 L IM TDS

X-ray chest should be done

(2) *Barbiturate poisoning*

(1) Stomach wash (2) Blood Barbiturate level. Intake and out put chart (3) I.V. Mannitol 7 cc./kg. body wt. followed by 5% glucose and 5% glucose saline to force diuresis (4) I.V. Lasix 1 mg/kg body wt. (5) Saline catharasis. (6) Watch for level of consciousness.

Watch Respirations if respiration slow and failing. Inj. Nikethinamide or Inj. Megimide or Inj. Ritalin. Artificial respiration may be necessary.

(7) Watch for kidney function—urinary output, Bun, if severe oliguria or Anuria—transfer the patient to Artificial kidney unit for dialysis.

(3) *Morphine Poisoning:*

Stomach wash.

I.V. or IM injection Nalorphine 0.01 mg./kg body wt. Can be repeated after 10-20 minutes if necessary.

Antibiotics—Inj. Proc. Pens. 4 lacs IM

Watch for Resp. failure

Artificial resp. if necessary.

Organo posphorous poisoning

Stomach wash

Antibiotics—Inj. Proc. pen. 4 lacs IM

I.V. or IM Inj. Atropine according the state of pupils, every 10-15 minutes. Antacids

Artificial respiration if necessary.

Alkaly ingestion

Do not induce emesis. Hospitalise patient

Parent education is very important regarding prevention of poisoning and accidents.

Snake poisoning:

Local Treatment—A tourniquet should be applied above bite. It should be released for 1 min. every 20

minutes. The local area should be washed with a mild antiseptic. The part should be immobilised and the patient rushed to the hospital. A local incision should only be done within a few minutes after the bite, otherwise it is not helpful.

(2) Antivenom available as a polyvalent sera (Cobra, Krait, Russel Viper, Echis Casnatus) should be given in the recommended doses after testing for hypersensitivity.

(3) Treatment of complication like respiratory failure, haemorrage etc.

29. Nephrotic syndrome

Investigations:

—C B C with E.S.R.

Urine Routine
Culture
total proteins—24 hours.

T.T., S. Proteins, S. Cholesterol

B.U.N., S. Creatinine

S. Electrolytes, if necc.

Plain X-ray abdomen, X-ray chest,

I.V.P. if required. Kidney Biopsy

Treatment:

Tab. Prednisolone 2 mg/kg/day or 60 mg/M^2/day in 3 divided doses for 6-8 weeks. or 10-14 days after the urine protein excretion has returned to normal. The dose is tapered and discontinued in last week. If relapse occurs within several months to a year after discontinuation of Rx., the above Rx. is followed by an interrupted schedule (after completion of course as above described.) as follows :—Tab. prednisolone 2 mg/kg/day or 60 mg/M^2/day on alternate days in a single dose in the morning for 6 months to 1 year. Antibiotics during the acute state. If necessary Salt Restriction—1 gm./day

Complications like hypovolemic shock during the first few days of relapse, sepsis due to cellutitis, pneumoccal peritonitis and renal failure should be looked for and treated vigorously.

Water intake limited if oedema does not respond. Diuretics—Lasix 1-3 mg./kg. in excessive oedema only.

Cyclophosphamide recommended only in special cases with expert supervision.

If protein excretion has not returned to normal within 1 month of (steroid resistant) daily adequate

steroid therapy—indication for re-evaluation and change of therapy. Renal Biopsy reqd.

Follow up:—Urine—routine/once a week at least Ht, wt, Bl pr., B.U.N. as required.

30. Acute Nephritis

Investigations:

C.B.C. with E.S.R. Repeat E.S.R. once a week, T.T. Urine Routine, Output, Culture and Antibiotic Sensitivly Repeat urine examination twice a week. B.U.N. S. Creatinine S. Proteins. S. Creatinine is good index for Glomerular Filtration Rate and should be repeated. If necc.: S. Electrolytes. S. Chotestrol. E.C.G., X-ray chest, L. P. Fundoscopy.

Management:

Bed rest.

Inj. Procaine Penicillin 4 lacs I.M. O.D. x 10 days.

Intake output chart.

Daily weight.

B. P. twice a day.

In Cardiac failure. Digitalisation, Oxygen, frusemide may be required.

In Hypertension:

Dietary Sodium should be restricted to 1m-Eq/Kg of body weight in young child and not more than 40mEq/

day in adolescent. If Oliguria is present fluid intake is restricted to amount equal to urinary output plus insensible loss (25 ml/kg/day in infant, and about 10 ml/kg/day in older child).

I.V. Frusemide 1-2 mg/kg is the usual dose.

I.M. Reserpine .05-.1mg/kg every 4-6 hourly.

Later can be given orally.

In case of Hyertensive encephalopathy together with Reserpine I.V. Methyldopa 10-20 mg/kg can used.

Or I.V. Diazoxide 5-10 mg/kg if available.

Anti convulsant therapy—Inj. Diazepam or Phenobarbiturate also to be given.

Actue Renal Failure is another complication.

In case of severe oliguria, progressive disease or failure of normal course of resolution patient should be refered to a Nephrology center.

31. Urinary Tract Infections (U.T.I.)

Investigations:

(1) *Urine analysis:* Midstream clean catch specimen. Local parts are cleaned with soap and water. In boys, foreskin must be retracted, in girls labia minora should be separated, while cleaning the part and collecting urine. In non co-operative

children suprapubic aspiration can be done. Urine should be examined within 30 mins. Best method is to centrifuge 10 ml. of urine, and examine the deposit. More than 5 W.B.C. per H.P.F. is suggestive of U.T.I.

(2) *Urine culture:* Same procedure for collection as above. Urine samples with a colony count of more than 100,000 per ml. indicates infection, below 10,000 per ml. is insignificant. This must be done to confirm diagnosis. Colony counts between 10-100,000 per ml. must be repeated. Two cultures are preferable.

(3) *Intravenous pyelogram with Micturating Cystogram-* (1 mth. after infection)

Indication:

(a) Every boy with a single documented infection.
(b) Girls after 1st recurrence of infection.
(c) U.T.I. associated with palpable abdominal mass, abnormal renal function test, raised B.P.
(d) If infection fails to clear inspite of adequate therapy.

(4) Retrograde Pyelogram, Cystoscopy, Renal function tests occasionally required.

Treatment:

(1) *Supportive:* Abundant fluids orally. Advised to empty bladder completely. Taught perineum hygiene i.e. cleaning from anterior perineum to anal region. Pyridium a urinary analgesic can be given for dysurea.

(2) *Specific:* Sulfasoxazole 60-100mg/kg., Ampicillin 100mg/kg. for 10-14 days. These are first line drugs and should be used for 2 weeks. Depending on sensitivity to antibiotics drugs like Chloramphenicol (100mg/kg orally) Kanamycin (15mg/kg I.M.) Gentimycin (4-8mg/kg I.M.), Erythrocin (50mg/kg orally), Polymixin B (3mg/kg I.M.) are used for 15 days.

If relapses are frequent long term treatment for 3-4 months is advised. Low doses of Septran or Furadanton also recommended as prophylaxis especially in Grade I & Grade II of reflux. Generally divided into two doses e.g. Nitrofurantoin 1mg/kg in 2 doses. Duration atleast 2-4 months.

(3) *Follow up:* (More important for prevention of recurrence). Urine culture should be repeated—

(a) 48 hours after specific therapy.
(b) One week after completion of therapy.
(c) Monthly urine cultures for 6 months.

(d) 3 monthly for next year.

(4) Patients with severe reflux or obstruction or atrophic kidney must be sent to the Urologist.

Correction of any structural anomalies that are amendable to Surgery.

32. Acute Renal Failure

Investigations:

(1) C.B.C., (2) Urine Routine, output, culture & sensitivity. (3) Serum electrolytes, (4) B.U.N. creatinine, (5) Blood Gases, (6) E.C.G., (7) Serum calcium, phosphorus, (8) Reticulocyte count, Platelet count, (9) Clotting tests, (10) Blood cultures, (11) A.S.O. A.N.F., (12) I.V.P. Voiding Cystogram Renal Biopsy.

Urine output less than .5 cc/kg/hr.

(1) Make sure patient is adequately hydrated for 2-3 hrs. followed by forced diuresis Mannitol. .5-1 gm/kg over a period of 30 mins. (25% sol).

Lasix may also be given 2 mg/kg I.V. push. If no urine or less than .5 cc/kg/hr treat as Renal failure.

If some urine obtained the above might be repeated.

(2) Record pulse, Blood pressure.

Treatment:

(1) Oliguric phase (water intoxication, hyponatremia.

(a) Fluid therapy Insensible loss (1/5th main-

tenance) + Urinary output (or 300 ml/m^2) Use 10-15% Glucose.

(b) Nasogastric tube suction replace fluid cc by cc. and chloride losses with bicarbonate.

(c) Strict intake/output, Record daily wt.

(2) High output phase Increase of fluid and electrolytes may be required according to urinary output and Blood electrolytes. Lasts for few hrs. to few days.

(3) *Hyperkalemia:*

(a) I.V. calcium Gluconate 10% .05 cc./kg. slowly.

(b) 2-3 cc/kg of $NaHCO^3$.

(c) After giving I.V. 1 cc/kg of 50% glucose, 1 unit/kg I.V. Insulin.

(d) Cation exchange resins can be used. Calcium or Potassium exchange resin 1 gm/kg orally or rectally.

(4) Treat the complications like Hypertension, seizures, acidosis, cardiac failure.

(5) Diet maintain calories about 150-200 K.cal/kg by mainly fat, and carbohydrate diet. 1-2 gm/kg of first class protein is allowed. If oral food not tolerated I.V. 10-15% Glucose can be given.

(6) Treat infection and septicaemia vigorously. Penicillin Ampicillin, Erythromycin and Doxacillin are safe as they are not nephrotoxic.

(7) Appropriate reduced drug dosage should be used for drugs excreted by kidney.

(8) Indications for Dialysis.

(1) Deteriorating clinical conditions as manifested by nausea, vomiting, drowsiness progressing to coma.

(2) Blood Urea more than 300 mg%.

(3) Potassium -6 m eq. for 3 hrs. inspite of treatment.

Or 8 meq. at any time.

(4) Over hydration.

(5) Progressive cardiac failure.

(6) Severe metabolic acidosis not being corrected with Sodiam bicarbonate

(7) Phosphorous more than 10 meq.

(8) Severe Hypertension.

33. Chronic Renal Failure:

Investigations:

(1) C.B.C.

(2) Urine routine, culture & Antibiotic Sensitivity

(3) B.U.N. Creatinine clearance.
(4) Electrolytes, pH.
(5) Ca, Phosphorous, serum Proteins, alkaline Phosphatase.
(6) X-ray chest, long bones.
(7) I.V.P. when indicated.

Treatment

(1) Fluid and sodium should only be restricted in case of oedema, salt wasting or abnomal concentration of plasma sodium.
(2) Restrict phosphates in diet—no milk—Calcium can be given 1 gm. orally/day, Aluminum hydroxide Gel 1 table spoon/tds. can be given in severe hyperphostaemia.
(3) Treat anaemia with iron, Vitamins etc. transfusion only if patient in failure or Hb. less than 4 gm.%
(4) Treat cardiac failure—judicious use of Digoxin as excereted by the kidney.
(5) Treat hypertension. Reserpine, Guanethidine, lasix.
(6) Correct metabolic acidosis with Sodium bicarbonate orally 1-2m. eq/kg. This is effective but add to Sodium over load.
(7) Control of Infection by antibiotics.
(8) Renal osteodystrophy Vitamin D25000-50000/units day may be given.

(9) Drugs excreted by kidney—appropriate dosage should be given.

(10) Diet. Adequate calories 150-200 k.Cal/kg. First class protein 1-2 gm/kg can be given. Foods containing potassium like squashes, sugar cane juice, chocolate, citrus fruits should be avoided. Diet should be mainly carbohydrate and fats. Rice, Potato, vegetable like pumpkin can be taken adlib. One egg per day is allowed. Calcium can be supplemented orally (1gm/day.)

(11) Dialysis and kidney transplants should be considered if conservative methods have failed in problems like (1) Growth arrest, (2) Severe renal osteodystrophy, (3) C.V.S. failure (4) Fluid Electrolyte and acid base disturbance. (5) Inability to carry out normal activities

34. Cardiorespiratory Arrest

Basic Precept:

(1) Don't harm patient by using wrong methods

(2) Don't waste time with useless diagnostic or therapeutic measures.

(3) Be certain of diagnosis.

Management:

(1) Clear mouth, pharynx, suction.

(2) Strike chest with closed fist.
(3) Mouth to mouth respiration 3-4 times.

Then insert airway and ventilate with Ambu bag. Connect Oxygen to Ambu bag.

(4) External Cardiac massage—rate about 60-80 per minute. Establish a rhythm of four sternal compression to every ventillation. Two persons are required for this. Patient should be connected to a cardiac monitor as soon as possible.
(5) I.V. infusion should be started. Later central line if possible.

(6) *Drugs*

(a) Adrenaline .5-2 c.c. of 1:10,000 solution I.V. or intracardiac.

(b) Sodium Bicarbonate 3 c.c./kg I.V. Blood gases should be done immediately.

(c) Calcium Chloride 2-3 cc. of 10% solution I.V. in 30-60 min. with careful cardiac monitoring. Intracardiac 1 c.c. can also be given. Injection of Calcium chloride into cardiac muscle can be fatal. Technique of Intra cardiac injection- For infants and children regular No. 20 or 22 is preferable. It is inserted in the fourth intercostal space on the left just below and medial to the nipple and aimed at the spine. The

plunger is withdrawn until blood flows freely only then injection is made. Care must be taken not to inject air bubble.

(d) Nor adrenaline drip in maintainance of patients cardiac out put following resuscitations.

(a) *Dilantin*—

(1) Major use: digitalis-induced ventricular arrhythmias.

(2) Dose: 3-5 mg./kg. I.V. over 5 minutes.

(f) *Lidnocaine*

(1) Major use: ventricular arrhythmias.

(2) Dose: 0.5—1 mg./kg. I.V. 20-60 min.

(g) *Propranolol*—

(1) Major use: digitalis-induced ventricular and supraventricular arhythmias, control of Premature Ventricular Contractions, recurrent Paroxysmal Atrial Tachycardia with Wolff Parkinson White Syndrome

(2) Beta-adrenergic blocker.

(3) Dangers: A.V. conduction disturbances, asthma, bradycardia. C.C.F.

(4) Dose: 0.01–0.15 mg./kg. I.V. over 10 min., repeat in 6-8 h. maximum 10mg.

(7) Defibrillation in increasing doses, (AC:1-200v.) if ECG shows ventricullar fibrilation.

35. Shock

Injection:

(1) C.B.C., P.C.V., (2) Blood group and cross match. (3) Electrolytes, (4) E.C.G., (5) X-ray chest. (6) Blood culture, (7) B.U.N., Blood sugar, (8) Blood Gases.
(9) L. P. (meningitis)

Immediate Treatment:

(1) Keep patient warm, elevate legs except in respiratory distress.
(2) Establish airway and ventilation by use of Oxygen nasal tube, mask, Ambu bag, endotracheal tube with assisted ventilation.
(3) Establish a venous line preferably central venous line—so that central venous pressure can be measured.
(4) Correct Metabolic acidosis.

Treat type of shock:

(1) Haemorrhagic—whole blood 15-20 c.c./kg—1st hour.
(2) Plasma loss—Dextran 20 c.c/kg.—1st hour.

(3) Burns—Albumin, Plasma, Electrolyte solution.

(4) Dehydration-Ringer-Lactate, half normal saline. In all cases after immediate treatment further fluids are given depending on deficits.

(5) *Endotoxin Shock:*

(a) Massive Antibiotics.
(b) In Gram negative infection—Steroids.
(c) Non adrenaline Drip 2mg/500 ml of Glucose at rate of 1ml/min. to maintain B.P. of 90 m.m.

(6) *Anaphylatic Shock:*

(a) Adrenaline 1: 1000 solution–0.1 ml/kg. I.M. Follow by 0.1 ml/kg. I.V. 1: 1000 may be repeated in 20 min.
(b) Steroids.
(c) Antihistaminics.
(d) In bronchospasm I.V. aminophylline 4 mg/kg every 4-6 hours.

(7) *Neurogenic shock:*

(a) I. V. fluids.
(b) Non adrenaline drip (see shock)'
(c) Atropine if significant bradycardia present.

(8) *Cardiogenic shock:*

(a) Treat arrhythmia, asystole (cardiacarrest),

(b) Relieve cardiac tamponade if present.

(c) Correct metabolic and electrolyte disturbances.

(9) *Rare cause of shock:*

Pulmonary embolism—(Oxygen, analgesics, digitalis) Respiratory disease, metabolic disease—diabetes, adrenal coritco steroid deficiency etc.

36. Cardiac failure

—Maintain intake and output chart

—Check B.P.—sleeping Pulse rate

Investigations:

(1) Hb., Hct, urine (2) Chest X-ray (3) E.C.G. (4) pH, PO2 PCO2 (5) Electrolytes when possible and necessary.

Treatment—Digitalis

	Parenteral	Oral
Less than 2 yrs.	.06 mg/kg	.08 mg/kg
more than 2 years	.04 mg/kg	.06 mg/kg

Routinely 1/4 dose I.M. or orally every 6 hours.

Rapid—1/2 dose I.V. or I.M.—rest in 4-6 hrs Very rapid—full dose I.V.

Maintainence dose 1/4—1/5 oral dose Potassium, orally supplemented.

(2) Diuretics frusemide I.V. or I.M. 1 mg/kg/day orally 2 mg/kg/day.

(3) Rest and sedation

Morphine may be given I.V. or sub out.

0.1/mg/kg—rarely required.

(4) Oxygen (5) Maintain good ventilation if necesdary assisted ventilation—Positive pressure breathing.

(6) Salt restriction

(7) Peritoneal Dialysis. Indications:

(i) Pulmonary oedema non responsive to diuretics (ii) Low Na C.C.F., (iii) accompanying renal failure

(8) Correct acidosis—metabolic acidosis with Sodium bicarbonate 5 ml/kg in severe acidosis initially—later calculate amount necessary.

37. Hepatic failure

Investigations:

(1) Hb., C.B.C.
(2) Urine, routine, bile salts or pigments.
(3) Serum Bilirubin, L.F.T. serum protein, S.G.P.T. S.G.O.T. etc.
(4) Blood Group cross match.
(5) Blood glucose, serum ammonia.
(6) Australian antigen, Viral Studies.
(7) Bleeding time, P.T., P.P.T.

Treatment:

(1) High Glucose I.V. or orally
(2) Neomycin orally 250 mg. every 6 hrs.
(3) Vitamin B12, C. I. V.
(4) Vit. K.
(5) Correct Electrolyte, fluid, acid base problems.
(6) Blood or exchange transfusion
(7) Sedative-Long acting, barbiturates.
(8) Antibiotic ampicillin or chloromycetin
(9) I.V. albumin
(10) Fibrinogen till level 300mg.—400mg.%
(11) Infective Hepatitis 5-20 cc. Gamma Globulin may be given.
(12) Bowel wash.

38. Management of Diabetic acidosis

I (1) Insulin I.M. mild case 1 unit/kg.
(2) Moderate I.M. 2 units/kg.
(3) Severe case 3 units/kg.
1/2 may be given intravenously.

Insulin may be repeated as 1 unit/kg depending on repeat blood sugar 3-4 hours later—or urine glucose repeated every 4-6 hours.

II I.V. fluids Normal saline 20 cc./kg in first hour, than 1/2 normal saline to supply deficit and maintainance therapy next 24 hours usually safe to calculate 10% dehydration 2400 cc/Sq. Mt. body surface.

Keep nil by mouth—Gastric lavage.

Severe acidosis may be corrected by giving Sodium Bicarbonate 0.5c.c. kg. body wt. Deficit should be calculated later.

As soon as the patient has passed urine Potassium should be added 40 m. eq/litre.

III Any evidence of infection should be treated.

IV Lab. Investigations.

(1) Blood sugar to be repeated 3-4 hours later
(2) Urine, glucose, ketones—repeat every 4 hours.
(3) Serum Electrolytes, Acetone, C.B.C. BUN.
(4) E. C. G. for hypokalemia.
(5) Blood Gases.

V Subsequent Management.

As soon as patients clinical condition is better and vomiting has stopped, patient can be started on oral feedings and I.V. discontinued. Potassium can be given orally. By the third day patient should be on a normal diet with a known content of carbodydrates. Adjust Insulin dosage according-to table below. After the

patient has been controlled on Crystalline Insulin, long acting insulins (Lente, N.P.H.) in a toial dose slightly less (2/3) of total dose of Crystalline Insulin should be given in the morning. Urine should be continued io be tested for glucose before breakfast, mid-day evening and before bedtime.

Large quantities of free sugar should be avoided *in* diet.

Crystalline Insulin dosage:—

Sugar	Acetone +	Acetone free.
4 +	20 units	16 units
3 +	15 units	12 units

Under 4 years 1-3 units for each + sugar Dose of long acting is then adjusted according to amount of glucosuria for 24 hours. On discharge patient should still be closely followed as the requirement of insulin will decrease.

(IV) Education.

Parents and older children before discharge should be reassured and educated about the problems of Diabetes. Emphasis should be on the child living as normal a life as possible.

PRACTICAL PROCEDURES

COLLECTION OF BLOOD SAMPLES

Capillary Sampling:

The heel is the most useful source in the newborn whereas in older infants and children the third finger is satisfactory. The ear lobe is said to be less painful and flow can be speeded and 'arterialized' by rubbing alcohol on the skin. The skin should be warm. This is to be assumed if the infant is in an incubator. The cleaned skin is pricked with a cutting stylet. A single vertical prick may produce a good flow in a child but to obtain a large volume from a neonate a slit should be cut in the heel a few millimeters in length. The cut need not be deep. This method is valuable when repeated capillary samples are required over a short period when only an initial cut is required. Further bleeding is stimulated at intervals by cleaning away the clot. A disadvantage of capillary sampling is that haemolysis of some degree is likely. This can be reduced by ensuring a fast flow and using siliconized tubes. Frothing or drying of the sample are potent causes of haemolysis. For certain investigations the capillary blood can conveniently be taken directly into glass capillary tubes (e.g. for gas analysis) or spotted on the special filter papers (e.g. for chromatography).

VENIPUNCTURE:

Superficial veins:

The puncture of superficial veins is the safest type of venipuncture. No complications are to be expected if the skin is cleaned and pressure applied to ensure haemostasis. Any visible vein in the back of the hand, the dorsum of the foot, the antecubital fossa, or the scalp may be used. Sometimes the scalp veins are first distended by placing an elastic band round the infant's head just above the ears. Scalp vein sets (21,23 or 25 gauge) are often used, consisting of a needle, plastic tubing and female butt.

Femoral vein:

The arms are restrained as described. The hips are fully abducted and the knees flexed to 90 degrees are held onto the table surface by the nurse. The femoral artery pulse is palpated and the femoral vein entered just medially to this in the inguinal crease. The needle, 38 to 50 mm long, should enter the skin vertically to pin the vein against the femur below. Blood is often more easily obtained when the needle is withdrawn after touching bone. A needle finer than 21 gauge might be ineffective. It is easy to produce a haematoma and transient cyanosis of the leg if the adjacent artery

is accidentally punctured. The use of iodine and the application of firm pressure for at least one minute after venepuncture are therefore important precautions. Rare complications include osteitis of the femur. arthritis of the hip and infected haematoma and spasm of the femoral artery with ischemia of the foot. If the artery is accidentally punctured pressure should be maintained for 5 minutes.

Blood culture:

Blood culture is so important in paediatric practice that a short account is included. At any age blood culture is only justifiable if carried out with rigorous precautions against contamination and under optimal conditions for harvesting the offending organism. In acute illness of early childhood initial perfection is imperative. There is rarely a second chance after the first blood culture.

Employ at least two culture bottles containing different media from your laboratory. These bottles are better warmed before venepuncture. The risk of contamination is increased if blood is not drawn cleanly on the first insertion of the needle. The skin is first cleaned with iodine in spirit. The cap of each of the culture bottles is also wiped with 2 per cent iodine in 70 per cent

ethanol solution. The iodine on both skin and bottle caps is allowed to dry. With the infant suitably restrained the chosen vein is punctured through the iodine stained skin. The needle should either be sterile and disposable or autoclaved. The shaft must not come in contact with the finger before introduction into the vein. After the sample is obtained the original needle is removed from the syringe and a second needle is used to inject the blood into the culture bottles. The iodine should be washed from the infant's skin with 70 per cent alcohol. The blood culture bottles are immediately placed in the incubator.

Radial artery puncture:

The skin is cleaned in the usual manner. A suitable size needle (gauge 21 usually) is attached firmly to a syringe and the dead space filled with heparin. Tuberculin syringe can be used. The infant's hand is supinated and held so that hand and forearm are straight, i.e. no wrist flexion or extension. The needle is inserted through the proximal wrist skin crease over the radial pulsation and at an angle of about 60 degrees to the skin: it is pushed thence till it just touches the radius whence with slight negative on thesyringe it is slowly withdrawn along its line of entry, withdrawal ceasing when blood is obtained. After arterial puncture the

syringe is sealed e.g. with a syringe cap or portion of plasticine. An assistant maintains firm and unvarying pressure on the puncture site for five minutes or till all bleeding has ceased. In the older child a small dose of local anaesthetic may be injected at the site of puncture before the procedure is performed.

INTRAVENOUS INFUSION

Scalp-vein infusion:

The scalp vein needle set is attached to a syringe containing physiological saline and air expelled from the dead-space of the set. The infant is restrained and the head held by the assisting nurse. Sedation at this time is not advisable since the distension of veins produced by crying makes entry of the needle easier. The scalp veins most constantly suitable for entry are on either side just behind or in front of the pinna of the ear or running down the middle of the forehead. In the shocked infant it is easy to mistake a scalp artery for a vein but the temporal arteries run in front of the ears rather than behind.

When a suitable vein is discovered the overlying hair should be shaved if necessary. The skin may be sterilized by 2 per cent iodine in 70 per cent ethanol which is removed with 70 per cent ethanol to allow easier visuali-

zation of the vein. A combination of stimuli may be required to distend the vein adequately. Venous return may be obstructed either by having the nurse press her finger over a proximal segment or by applying an elastic band around the infant's head just above the pinnae near the position of maximum circumference. Tapping the vein sharply with the finger tends to ready it further.

Enter the vein where there is a good length of straight vein downstream. Piercing the skin with the scalp-vein needle may be difficult if the skin is tough. If the direction is too deep it is easy to drive through the skin superficial to the vein and it may be easier to pierce the skin, pause and then enter the vein. It may be necessary to make repeated insertions at slightly less acute angles. When the vein is entered then blood flows back into the plastic tubing. This may not happen in the collapsed infant. Small quantities of fluid are injected from the syringe believed to be in the vien and if the needle is not in situ a subcutaneous bleb appears.

After the vein has been entered it is easy for a restless infant to dislodge a scalp vein needle. The needle should be inserted 0.5 to 1 cm into the vein. The process is easier if at the same time saline is injected through the needle. This keeps the vein wall distended so that

accidental exit is unlikely. With the needle is adequately in the vein tape it to the scalp with sticking plaster or [plaster of Paris.] Also tape a loop of the connecting tube to the forehead. Now is the time to administer a sedative such as triclofos (30 to 50 mg per kg.)

Cut-down infusion:

Cut-down techniques are widely known. The important point for the paediatrician is to ensure that the instruments are of appropriate size, are sterile and the scissors sharp. In a general hospital with central services it is common-place to find sets with large forceps and scissors totally unsuitable for delicate work on an infant (or an adult).

Cut-down infusion:

The infant should be kept warm and oxygenated. The leg is bound to a padded splint with the leg externally rotated. The incision is made above the medial malleolus and at right angles to the vein. The vein is picked up by dissecting forceps and a curved probe passed underneath to free the vein of surrounding tissue. The vein is then tied off distally and a cut made with scissors across the vein. A plastic cannula is then inserted and tied in with 1 to 2 cm in the vein. The wound is then closed with two stiches or adhesive

strips. This drip should not be run longer than two to three days or phlebothrombosis, infection or both is inevitable. Imaginative and dexterous use of the scalpvein sets in a variety of non-scalp areas (e.g. wrist, elbow, arm, ankle, foot) greatly reduces the need or cut-down procedures.

HAEMATOLOGICAL PROCEDURES

Marrow Aspiration:

With the patient in the 'lumbar puncture' position the posterior iliac crest is palpated and the posterior superior iliac spine located at the lower end of the crest. It is helpful to mark the line of the crest with iodine used as a skin antiseptic. With the crest grasped between thumb and forefinger the skin' subcutaneous tissue and periosteum is infiltrated with 2 ml of 1 per cent xylocaine (or equivalent) at a point 1 cm above the spine in young children and 2 cm above it in older children using a fine needle. During infiltration move the point of the needle a few millimetres first one way and then the other across the surface of the crest so as to define the exact limits of its subcutaneous surface. Allow two minutes for the local anaesthetic to become effective and then using strict aseptic technique push a marrow puncture needle and trocar (i.e. Klima Pattern) of relatively wide bore (1.5 mm) through the skin with

a rotating action down to the periosteum and locate the most central subcutaneous portion of the crest. The needle and trocar are then directed in a strictly anterior direction (in all planes) and pressed into the bone with an alternate clockwise and anticlockwise boring action with a firm movement. As soon as the needle is sufficiently inserted into the bone to remain fixed by itself without support the trocar is briskly with drawn. A fleck of pink marrow may be seen on the tip of the trocar confirming that the needle is within the marrow cavity. Strong suction is then applied with a 20 ml sterile syringe and stopped after about 0.2 ml of blood (and marrow) enters the syringe. If nothing can be aspirated the trocar is replaced, the needle advanced a further 1 to 2 mm and aspiration repeated. If still unsuccessful the procedure is repeated 1 to 2mm on either side of the original position. After obtaining aspirate the trocar is replaced and the needle withdrawn covering the puncture site with a sterile dressing. The aspirate is expelled in equal amounts on to 8 to 10 microscope slides in succession and the surplus fluid blood is sucked back into the syringe. Smears are made of the sedimented marrow cells and particles and the slides waved in the air to achieve rapid drying. The remaining iodine is removed from the skin with sur-

gical spirit and a sterile adhesive and occlusive dressing placed over the puncture site.

Marrow puncture is contra-indicated in haemophilia or Christmas disease but is safe in the presence of even severe thrombocy topenia, when care is taken to ensure continued firm pressure after the procedure.

Tibial Puncture:

This site is used for marrow puncture in preference to the iliac crest on an average child up to six weeks or in very small babies up to the age of three months. It is important to avoid damaging the epiphysis in the region of the tibial tubercle since a disturbance of bone growth could occur in later life. The subcutaneous anteromedial surface of the tibia is palpated and the tibial tubercle identified. A site in the middle of the subcutaneous surface 2.5 cm (1 inch) below the tubercle is chosen. A needle with a guard is used to puncture the skin and then the bone with a 'boring' motion keeping the needle strictly at right angles to the subcutaneous surface of the bone. When the needle point touches the periosteum before entering the bone the guard is adjusted to allow bone penetration to a depth of 2 to 3 mm. In other respects the procedure is as described for the posterior iliac crest puncture.

Bleeding Time (IVY Method):

A sphygmomanometer cuff is inflated to 40 mmg. and maintained at this pressure throughout the test. The skin is swabbed with ether, allowed to dry. The skin over the fleshy flexor muscles on the lateral aspect of the antecubital fossa is held taut by finger and thumb then a stab incision 2 mm long and deep is made. This is blotted at 15-second intervals on to a large sheet of folded absorbent paper recording the duration of visible bleeding for each. The upper limit of normal bleeding time for a single puncture is 6 minutes. The test is terminated at 15 minutes if bleeding has not stopped by releasing the sphygmomanometer and covering the puncture sites with cotton wool.

Capillary Fragility Test (Hess.)

A sphygmomanometer cuff is inflated to a pressure between that of systole and diastole (90 mmHg) and kept at this pressure for 5 minutes. After removal of the cuff the antecubital fossa is inspected for petechiae. If more than 20 fresh petechiae can be seen the test is positive. If spots are present before beginning mark these and define the area so treated with a line.

CENTRAL NERVOUS SYSTEM

(1) **Transillumination:**

This simple and safe method of examination of the

infant head is too often neglected. A case can be made for its routine use in the neurological examination of an infant during the first year of life, and in selected cases at later ages. Careful technique is essential. The infant is taken into a totally blacked-out room. The examiner uses a strong torch fitted with a black rubber adapter which prevents the escape of stray light when it is pressed against a flat or convex surface. He begins by testing his own dark adaption by attempting to transilluminate the palm of his hand. The infant's head is then systematically explored by switching on the torch when it is pressed against the frontal, central and occipital regions on each side, and also in the midline posteriorly over the posterior fossa. Normally there is a narrow rim of transillumination around the adapter, the precise diameter of which depends on the characteristics of the light employed. The rim is greater in the frontal regions, and is inversely related to age. Abnormalities include generalized transillumination in hydranencephaly or aqueduct stenosis, unilateral increases in subdural effusion or porencephaly, posterior fossa glow in the Dandy Walker syndrome or some arachnoid cysts, and multiple illuminated regions in cystic encephalomalacia. Suspected abnormalities may sometimes be more precisely defined by directing the light serially through them from more than one direction.

(2) **Lumbar Puncture:**

This is most commonly carried out to determine whether meningitis is present. If such a diagnosis is seriously considered there are no absolute contra-indications other than infection of the lumbar-skin, or gross malformation such as spina bifida cystica at that site. Raised intracranial pressure is usually a contra-indication but this is by no means always the case as for instance in meningeal leukaemia and known communicating hydrocephalus. When there is evidence or suggestion of increased intracranial pressure, with or without papilloedema, suspected to be due to tumour, abscess or other mass, or obstructive hydrocephalus of any other cause, lumbar puncture is contra-indicated.

The technique is easier for the operator and much to be preferred for the child if sedation is used sufficient to induce amnesia. Most operators prefer the lateral decubitus position, with the child's knees held in a flexed position near his face. It is wise to ensure that an experienced assistant is able to hold a flexed infant firmly immobile before beginning the lumbar puncture proper, otherwise struggling may spoil the procedure at a critical moment, should the sedation prove inadequate. After skin preparation (2 per cent iodine in 70 per cent ethanol is effective) local anaesthetic such as 1 per cent

lignocaine may be infiltrated at the chosen site between the second and third lumbar spines. This level is approximately indicated by a line joining the superior iliac rests. Many omit the local anaesthetic for rapid punctures not involving pressure measurements. A short fine lumbar puncture needle with a stilette (for instance No. 22 needle which has a very short bevel) is pushed through the skin and then slowly advanced anteriorly and very slightly cephalad with a slight rotatory motion until a barely felt click sensed through the tips of the index finger and thumb signals the penetration of the ligamentum flavum and dura mater. In small children the first appearance of cerebrospinal flud (c.s.f) is less likely to be missed if the stilette is withdrawn after the skin has been punctured and reinserted briefly from time to time with each small movement deeper. Otherwise the narrow subarachnoid space may be crossed unwittingly, the anterior plexus of veins transfixed, and a bloody tap result. The use of a small (No. 23) butterfly scalp vein needle with its attached tubing has been advocated for lumbar puncture in the newborn to reduce the chance of such a 'bloody tap', but there is a small risk of implantation spinal epidermoid tumours if a needle without a stilette is used to penetrate the skin.

(3) **Subdural Puncture:**

This is carried out for the diagnosis and treatment of subdural 'haematoma' or effusion. It is sufficiently safe to be recommended at an early stage when such a condition is suspected, provided that it is remembered that it is not entirely without risk. This is especially so when the operator is inexperienced. Haemorrhage and persisting effusion may be induced and if the brain is punctured; the possible complications are similar to those described under ventriculography. Infection including the very serious subdural empyema is possible if technique is grossly lax.

The site of puncture is the lateral angle of a large anterior fontanelle or just lateral to it (in the coronal suture) if it is small. After shaving, preparation of the skin with 2 per cent iodine in 70 per cent ethanol and draping with the infant securely held supine, the skin is displaced and punctured by a fine short bevelled needle (No. 22, 3.8 cm long) with a stilette before being released into its normal position. This Z-track technique reduces the likelihood of continued fluid leakage and infection later. The needle is then advanced caudally, towards nasion until a 'give' is felt as the skull is penetrated. It should then be advanced not more than 2 or 3 mm with the stilette withdrawn. Normally no advance

of the needle is necessary. If a few drops (sometimes more) of clear fluid are obtained it is likely that the subdural space has been traversed and that one is sampling subarachnoid c.s.f. This will have a protein content higher than lumbar c.s.f., but not the very high concentration characteristics of subdural effusions.

If subdural fluid is encountered (proteinaceous, cloudy, yellow, brown or red) it is allowed to drain into a centrifuge tube or test tube, removing a maximum of 20 to 40 ml. Large quantities of c.s.f. should not be aspirated with a syringe. Firm pressure is applied with a cotton wool ball after the needle has been withdrawn. Some operators put a silk suture around the skin puncture, but this should not be required with the technique described. Whether or not the first diagnositc tap is negative or positive it is always repeated on the other side. After any such subdural puncture there is commonly some seepage of c.s.f. under the scalp and so transillumination becomes falsely positive.

RESPIRATORY SYSTEM

Pleural Aspiration:

Aspiration of a pleural effusion may be indicated for diagnostic or therapeutic reasons. It is an un-

pleasant procedure and in most instances the child should be sedated In all instances local anaesthesia should be used. The infant or child should preferably be seated on a firm surface sitting upright with his arms placed forward over pillows. Sufficient pillows should be employed to make his back as nearly perpendicular as possible. Standard aseptic technique is employed.

When the effusion is large the site of entry is in the sixth intercostal space in the scapular line. When the effusion is localized, as indicated by clinical and radiological examination, the site of entry is best made over the area of maximal dullness on percussion.

A large bore needle or suitably sized trocar (16 to 18 gauge 4–5 c.m. in length) is employed: if thick pus is expected then a wide bore instrument is essential. A bone-marrow aspiration needle may be very useful in tapping a thick empyema. A suitable size syringe and two-way taps are attached to the needle before the skin puncture: a length of plastic tubing should lead from the side arm of the tap to a receptacle for collecting the aspirate. Sterile containers for bacteriological specimens should be at hand.

The needle is inserted in the sixth intercostal space just above the seventh rib and slowly advanced in a

forward and slightly medial direction. If slight negative pressure is maintained on the syringe then fluid will be drawn off as soon as the effusion is entered. If much fluid is to be withdrawn, aspiration should be performed fairly slowly. Antibiotics may be instilled if indicated at completion of aspiration before the needle is withdrawn. The site of the puncture may be covered with a sterile swab to avoid leakage from the wound. Repeated aspiration may be performed in this manner though it is best not to use precisely the same puncture wound each time.

If drainage of a tension pneumothorax is required then the tension should be released slowly and water seal drain incorporated with the polyvinyl tube left in situ. Care should be taken to ensure that no fluid can return through the tubing into the chest by positioning the bottle well below the level of the patient.

Mouth To Mouth Respiration:

This procedure is indicated in emergency situations when more sophisticated methods of maintaining respiration are not available or not yet to hand, e.g. drowning, gas poisoning, sudden collapse, etc.

Method:

Any foreign material should be removed from the

nose, mouth and throat. The patient is laid supine on a flat surface with neck extended. The operator positions himself by the head and inhales then applies his mouth to form a tight seal around that of the patient. For an infant or a small child it may be simpler to include the nose as well the mouth in the seal: the older child's nostrils should be closed by pinching to prevent air escaping. The operator blows into the patient and if the manoeuvre is correctly performed expansion of the patient's chest will be seen whence contact is stopped while the patient passively expires. The procedure then is repeated with the force and rate varying with patient size; short puffs are adequate in the small infant and larger steady blows in the older child. A Brooks airway may of course be used in the older child if available.

In an emergency situation the operator may have to perform external cardiac massage in addition to mouth to mouth respiration; a rhythm of one respiratory to three of four cardiac strokes should be employed but the combined procedure is difficult if it is to be effective.

CARDIOVASCULAR SYSTEM

Pericardiocentesis:

Accumulation of fluid in the pericardial space of sufficient quantity to cause cardiac embarrassment and

necessitate aspiration is rare in the paediatric age group in the absence of trauma or in the postoperative situation.

Pericardiocentesis may be required as a diagnostic procedure, e.g. in purulent pericarditis or therapeutically as for instillation of appropriate antibiotics, or as an emergency procedure in haemorrhagic tamponade.

The decision to use sedation should rest with the operator and his assessment of the condition of the patient: it should probably be used in most instances unless the child is collapsed. Electrocardiogram monitoring during the procedure is advised and it may be preferable to connect the aspirating needle to the V lead whence myocardial damage may be indicated by elevation of PR or ST segments of the electrocardiograph. A supply of oxygen should be at hand.

The infant should be laid supine: the older child may have a pillow as a head rest. Local anaesthesia thould be used in all instances. A wide-bore neddle or a suitable trocar (16 to 18 gauge, 7.5 cm, short bevel) may be used. Full aseptic technique is employed. The usual site of entry is in the fifth left intercostal space anteriorly, 2 cm. within the area of cardiac dullness, with the needle pointing slightly upwards and medially. Alternatively the needle may be inserted in

the angle between the left costal margin and the xiphoid process whence it should point upwards, backwards and to the left. The needle should be advanced cautiously and may be felt to penetrate from the skin surface. If a diagnostic tap only is required a 5 ml volume syringe should be firmly attached to the needle before insertion.

In most instances it is best to attach a two-way tap to the needle specially if the effusion is large or if antibiotics are to be instilled the tap also helps to avoid the introduction of air. If the effusion is large aspiration should be performed with careful observation of the patient's condition.

ALIMENTARY SYSTEM

(1) Parcentesis Abdominis:

This type of puncture requires no sedation or local anaesthetic unless the child is exceptionally excitable or restless. Care should be taken to clean the skin with 2 per cent iodine in 70 per cent ethanol.

A short bevelled intravenous needle which is 5 to 8 cm. long is inserted in the midline, midway between the symphysis pubis and the umbilicus if ascites is gross, and in the flank at the level of the umbilicus if it is less gross. The reclining position supine is often

the best position for the patient who is slowly propped up into a half-sitting position. The area into which the needle is being introduced will be dull and care should be taken to avoid an enlarged liver, spleen or bladder. Fluid is withdrawn and investigated for organisms and cytology, by culture or biochemically as indicated. The iodine remaining is cleaned off the skin with 70 pr cent ethanol. Removal of ascites is rarely required therepeutically. It is then prefarable to drain slowly with a needle by attaching on I.V. dripset with an inverted Murphy's drip chamber.

(2) **Liver biopsy:**

Contra-indications to biopsy are bleeding tendency (prothrombin less than 50 per cent, platelets less than 100,000), fulminant hepatocellular failure, vascular tumours and hydatid cysts. One pint of blood should be available. The child should be kept at rest after the procedure and vital signs monitored for 24 hours. The Menghini needle is the simplest and safest to use. If the liver is large a subcostal route may be employed, otherwise it is usual to use the lateral intercostal route. Serious complications with this needle in competent hands are very rare indeed. General anaesthesia is not necessary in infants, in whom an assistant can restrict respiration during the three or four seconds of puncture.

STEROID ASSAY METHODS

1. *Resting Levels of Urinary* 17 *OHCS* :
   (a) Significance : The group of steroids measured by this test represents approximately 1/3 of the end products of the metabolism of cortisol (mainly produced by adrenals).
   (b) Technique for test : 24 hr. urine collection. Send immediately to laboratory.
   (c) Normal Values : Adult male : 3-9 mg/24 hrs. Adult female : 2-8 mg/24 hrs.
   6mos to 15 years : 3.1 ± 1 mg-M^2 -24hrs.
   (d) Abnormal Value : Decrease in
      (1) Inanition states
      (2) Pituitary deficiency
      (3) Addison's disease
      (4) Administration of synthetic steroids
      (5) Congenital adrenal hyperplasia due to 21 Hydroxylase deficiency
      (6) Liver disease, hypothyroidism
      (7) New born period.

Increase
   (1) Cushing's syndrome
   (2) ACTH, Cortisone therapy
   (3) Medical and surgical stress
   (4) Obesity
   (5) Hyperthyroidism

(6) Congenital adrenal hyperplasia due to 11 Hydroxylase deficiency

2. *Resting Levels of Urinary* 17 KS :

(a) Significance : Represents part of the end products of adrenal and testicular androgen metabolism.

(b) Normal Values : First few weeks : upto 2 mg. for 24 hrs.
One month to 5 yrs : 0.5 mg/24 hrs.
6—9 yrs. : 1—2 mg/24 hrs.
Puberty : progressive increase to adult levels.
Adult male : 7–17 mg/24 hrs.
Adult female : 5–15 mgs/24 hrs.

(c) Abnormal Values: Decrease: Addison's disease Panhypopituitarism and anorexia nervosa.

Increase : Adrenal hyperplasia, virulising tumour or adrenal cortex, Cushing's syndrome, administration of hormones like testosterone, ACTH and Cortisone

3. *Adrenal Capacity Test* :

IM ACTH Test

a) Singificance : It measures maximum capacity of adrenal gland to produce cortisone.

b) Technique : Days one and two : 24 hrs. urine for control 17 OHCS.

Days 3, 4, 5, 6 : Administer 20 mgs. body surface —M^2 ACTH GEL every 12 hrs. IM.

Days 5, 6 Collect urine for 24 hr. 17 OHCS

c) Normal Values : Urinary 17 OHCS increase by 5—10 times

d) Abnormal Values :

(1) lack of response seen in Addison's disease

(2) Subnormal response in congenital adrenal hyperplasia

(3) After stopping of long-term steroid treatment, patients will have normal response

(4) Hyper-response seen in Cushing's syndrome

4. *Pituitary Suppression Tests*

(a) Significance : Administration of dexamethasone will suppress ACTH in normal subjects and urinary 17 OHCS will decrease.

(b) Technique : Days 1, 2 No mednication
Days 3, 4, 5 : Administer dexamethasone 1.25 mgs/100 lbs. of body weight per day (in four divided doses)

Days 6.7,8: Administer dexamethasone 3.75 mgs/100 lbs. of body weight (four divided dose.)

Collect 24 hrs urine on days 1, 2, 4, 5, 7, 8 for urinary 17OHCS

(c) Normal Values : By day urinary 17 OHCS should have decreased to less than 2 mgs/24hrs.

(d) Values : (1) In Cushing's syndrome from any cause by day five urinary 17 OHCS are more than 2 mgs/24 hrs.

(2) In Cushing's syndrome due to bilateral adrenal hyperplasia by day 8 urinary 17 OHCS are less than 2 mgs/24 hrs.

(3) In Cushing's syndrome due to adresnocortical carcinoma urinary 17 OHCS are more than 2 mgs/24 hrs. by 8th day.

(4) In certain hypothalmic tumours no suppression is obtained.

SUMMARY OF LABORATORY INVESTIGATION

(1) Routine :

(1) C.B.C. (2) Urine (3) Screening (4) T.T. 1:1000

(2) Fever :

X-ray chest—P.A. Lat (2) Widal (3) Urine culture (4) Throat culture (5) Blood culture (6) Smear for Malarial Parasite (7) Stool for ova and parasite and culture (8) L.P. (9) E.S.R., C. reactive protein (10) A.S.O., R.F., L. E., factors (11) Bun, creatinine, I.V.P., Micturating cystogram (12) Paul Bunnel test, Weil felix, V.D.R.L. (13) Bone Marrow Lymphnode biopsy (14) E.E.G., brain scan, Aortogram.

(3) Anaemia :

I. (1) Peripheral smear exam. (2) M.C.V., M.C.H. M.C.H.C. (3) Retic count (4) Blood Group & Gross match (5) Serum Iron (6) Fehling's test

II. Coombs test (2) Platelet count (3) Fragility test (4) Sickling test (5) Abnormal Hb. Electrophoresis (5) Bone marrow (7) G.6 P.D. test. (8) Bleeding time, Clotting time (9) P.T., P.T.T. (10) Bun, Creatine (11) Lead Level (12) X-ray skull, long bones (13) R.B.C. scan, splenic scan.

(4) Failure to thrive, loss of weight :

(1) Dietic History (2) Constitutional factors (3) R/o Infections (No. 2) (4) Metabolic-Blood sugar, Bun, Creatinine, Electrolytes, Ca., Phosphorous, Alkaline, Phosphatase L.F.T., S.G.P.T., Serum Proteins, Cholesterol (5) G.I.-Stool culture, occult blood, sugars trysin, fat, Ba studies (6) Resp. T.T. Bronchogram Bronchoscopy Sweat Chlorides (7) Endocrine P.B.I., 131 uptake, growth hormone, X-ray long bone (8) Immunoglobin electrophoresis, skin test, lymphnode biopsy. (9) Other Chromosomes, buccal smear, urine for aminoacids, X-ray abd., I.V.P., X-ray skull, Brain scan, E.E.G.

(5) Breathlessness Cough :

I. Resp. T.T. X-ray chest Eosinophil count, Sputum exam. and culture Bron-choscopy, Bronchography, Tomogram, Blood Gases, Pleural Tapping, sweat Chlorides, Pulmonary function tests, lung biopsy, Immunoglobins.

II. (a) Cardiac X-ray chest, E.C.G., Electrolytes Blood Gases, vector cardiography, viral studies, E.S.R., A.S.O. titre, Blood culture, Cardiac catheterisation Aortogram, Pericardiocentesis.

(b) Oedma (Kidney)

(1) Urine culture (2) Bun, creatinine, choles-

terol (3) I.V.P. (4) Urine 24 hr. protein, (5) Electrolytes (6) Kidney Biopsy

(6) Jaundice (1) see 3 II

II. Serum Bilirubin, S.G.O.T., S.G.P.T., L.F.T. Vandenburg, Bromsulphthalein, Flocculation tests, Liver scan, biopsy Ascitic tapping splenoportogram, smear for Malarial Parasite, Ceruloplasmin, Australian antigen, Alpha fetoprotein, serum ammonia, viral studies, Rose Bengal, stool exam. ova, parasite, Bl. culture, group Crossmatch, urine dye test for toxoplasmosis, for inclusion bodies, X-ray skull Fundoscopy, Laprotomy and Cholangiography.

(7) Abdominal Pain :

II. See above (1) Urine culture, I.V.P., X-ray abd. Micturating Cystogram (2) serum amylase, widal, V.D.R.L. (3) Proctoscopy sigmoidoscopy, (4) Gastric analysis (5) Urine for porphyrins.

(8) Gastroenteritis (Acute)

(1) Stool culture, ova, parasite, (2) Electrolytes Bun (3) Blood gases (4) Stomach wash for culture and analysis.

(9) Persistant Vomiting :

(1) Urine, Bile salts and pigments (2) L.F.T., (3) Glucose Tolerance Test (4) Electrolytes Bun

creatinine, Ca., Phosphorus (5) Blood culture (6) Ba Swallow, X-ray abdomen., I.V.P. X-ray., skull chest (7) L.P. (8) Poison and chemical analysis (9) 17 Keto Steroid (K.S.) in Urine

(10) Malabsorption (Chronic Gastroenteritis)

(1) Stool ova, parasite, culture, occult blood pH., trypsin, fat, sugar, Benedicts and Chromatography (2) Serum proteins (3) Barium studies (4) Sweat chloride (5) L.F.T., S.G.P.T. (6) Serum Amylase (7) Serum Carotene (8) Proctoscopy and sigmoidoscopy (9) X-ray chest and long bones (10) Jejunal biopsy (11) Dietic Response

(11) G. I. Bleeding :

(1) Group and Crossmatch (2) L.F.T. (3) Barium swallow (4) Splenoportogram (5) Stool for occult blood, parasites, culture, Bleding clotting time P.T., P.T.T. (7) Gastric analysis (8) Proctoscopy and sigmoidoscopy (9) Technectium scan for Meckels diverticulum (10) Arteriography

(12) Bleeding Disorder :

Platlet count (2) Reticcount (3) Bl. group and crossmatch (4) Bleeding time, clotting time (5) P.T., P.T.T. (6) L.F.T., S.G.P.T. (7) Bun creatinine (8) Thromboplastin generation time

(9) factor VIII, IX etc. assay (10) Fibrin split products.

(13) Arthritis :

(1) E.S.R., C.R.P., (2) X-ray joint (3) A.S.O. antistreptokinase factor (4) R.F., L.E. Prep, Antinuclear Factor, (5) Throat culture (6) X-ray chest (7) Blood culture (8) Joint fluid examination (9) viral studies (10) L.F.T., S.G.P.T., Australian antigen (11) Lead Level.

(14) Congenital Heart disease :

(1) X-ray chest (2) E.C.G. Vector Cardiogram. (3) Blood gases (4) Cardiac Catherisation, Angiography (5) Blood culture (6) Electrolytes (7) Echo Cardiogram.

(15) Rheumatic Heat Disease :

(1) E.S.R., C.R.P., (2) X-ray chest (3) E.C.G., (4) A.S.O., and antistreptokinase titre (5) throat culture (6) Blood culture (7) Cardiac catherisation (8) Angiography (9) Vector cardiography (10) Blood gases (11) Electrolytes. (12) Echo Cardiogram.

(16) Convulsions :

(1) Ca., Phosphorous Alkaline Phosphorase Bl. sugar, Electrolytes, BUN, (2) L.P. (3) X-ray

skull (4) E.E.G., (5) Fundoscopy (6) Urine for reducing substances Fehling's test, aminoacids (7) Brain scan (8) angiography (9) Urine for cytomegalic inclusion bodies, Toxoplasmosis dye test and cultures.

(17) Coma :

(1) BUN., Blood sugar, Electrolytes (2) Fundos copy (3) X-ray skull (4) Poison and chemical analysis (5) L.F.T., Serum ammonia, S.G.P.T. (6) L.P. (7) Urine for reducing substances, Fehling's test (8) viral studies.

(18) Ambiguous genitalia :

(1) Buccal smear (2) chromosmal studies (3) Electrolytes (4) Estimation of 17 Keto Steroids (K.S.) and response to steroid administration (5) testicular biopsy (6) Vaginogram (7) I.V.P. (8) Explorative Laprotomy.

(19) Mental Retardation :

(I) Blood Glucose, BUN., Electrolytes, Ca., Phosphorous L.F.T., G.T.T. Alkaline Phosphatase (2) X-ray skull, Wrist, Chest, Long bones (3) Sex Chromosomes Karyotyping (4) Urine for amino cinds, Reducing substances, ferric chloride. (5) Liver. Bone marrow, Lymphnode biopsy (6) Fundoscopy,

slit lamp examination (7) P.B.I., T4 Cholesterol (8) Viral studies.

(20) Endocrine :

(I) Thyroid (1) Cholestrol, P.B.I. T4., 131 uptake, Thyroid binding Globulin X-ray long bones.

(II) Pituitary (1) Human Growth Hormone Arginine and Insulin tolerance Immunoassary. (2) T.S.H. Response of 131 uptake to T.S.H. (3) A.C.T.H., Dexamethasone suppression test (4) F.S.H., L.H., Human Chorionic Gonodotrophin Immunoassay, Pregnancy Tests

(III) Adrenal Medullary :

(1) Histamine and Reditine test (2) Urine and serum estimation of epinephrine. Norepinephrine and V.M.A. estimation.

(IV) Adrenal Cortical :

(A) Aldosterone

(1) Scrum Electrolytes (2) Response to Sodium deprivation (3) Response to Aldosterone.

(B) Cortisol

(1) Water load test (2) Effect of dexamethasone and A.C.T.H. on 17 Hydroxy Costicosteroids (3) Metapyrone test.

(C) Androgen :

(1) Dexamethasone suppresson of 17 K.S.
(2) Urine estimation 17 K.S., 11 oxy., K.S.

(V) Testicular Hermones :

(1) Lack of suppresion of 17 K.S. by Dexamethasone (2) 17 K.S. in Urine & serum.

(VI) Ovarian ·

(A) Oestrogen Vaginal smear or biopsy and Endometrial biopsy, serum, urine estrogen,
(B) Progestrone vaginal smear, Endometrial biopsy urine pregnanediol.

LABORATORY INVESTIGATION

SPECIAL LABORATORY TESTS

2. *Oral Glucose Tolerance Test :*

a. *Purpose :* To test GI absorption and body metabolism of glucose.

b. Patient must have an adequate diet 3 days prior and must be N.P.O. 12 hours before test. Dosage of glucose 1.75 gm./kg.
For all, minimum of 10 gm. and max. 50 gm. Mix glucose with water and lemon juice as a 20 per cent solution. If not taken well, gavage.

c. *Specimens :* Capillary or venous blood. Source should be consistent throughout a single test.

d. *Time :* O minutes, 1/2 hour, 1 hour, 2 hours. 3 hours. (Add 4 and 5 hour specimens when evaluating hypoglycemia.)

e. *Urine* : Collect at 0, 1 and 2 hours and analyse for sugar.

f. *Normal* : Peak at 1/2—1 hour. Often at or near fasting level at 2 hours.

Normal Values when Total Reducing Substance Measured Using Capillary Blood

Time :	0	1/2hr	1 hr	2hr	3 hr	4 hr	5 hr
Mg%:	90+3	162+9	131+7	108+6	91+5	91+3	94+3

2. *Galactose Tolerance Test :*

a. *Purpose :* This is used to distinguish type I glycogen storage disease (glucose-6-phosphatase deficiency). It should not be used in galactosemia.

b. *Method :* Galactose 1 gm/kg is administered orally as a 20% solution over 3 minutes.

c. *Specimen* : 0, 5, 15, 30, 45 *minutes*

3. *The Ferric Chloride Reaction :*

a. *Principle :* Certain compounds react with Fe chloride to form coloured derivates (see chart below). Phosphate ions, which could artificially produce a negative result are removed by precipitation as $NgNH_4PO_4$. Therefore, we suggest the *optima* method which follows :

b. *Reagents :* Ferric chloride reagent : Dissolve 1.0 gram ferric chloride ($FeCl_2.6H_2O$) and one gram ferrous ammonium sulfate ($Fe(NH_4)(SO_4)_2(6H_2O)$ in 100 ml 0.02N HCl. Can store at room temperature. Should be labelled Ferry's $FeCl_3$ reagent.

c. *Procedure :*

1.1. ml $FeCl_3$ reagent in cleantest tube.
2. 10 drops (0.5ml. urine, mixed well by shaking;
3. Observe colour;
4. Disregard color appearing later than 10-20 seconds.

TABLE No. — 9 INTERPRETATION OF THE FERRIC CHLORIDE REACTION

Materials Giving Positive FeC13 Reaction	Clinical Condition in Which Present	Colour Produced
Phenylpyruvic Acid	Phenylketonuria	Green fading over hours
Homongentisic Acid	Alkaptonuria	Blue-green; fades quickly
Salicylates	Salicylate Ingestion	Stable purple; might be negative if urine is *strongly* acidified
Phenothiazine Derivatives	Compazine & Thorazine Ingestion	Blue-purple
p-Aminosalicylic Acid (PAS)	PAS Ingestion	Red-brown
Phosphates, Other Anions	Normal Urines	White to brown; precipitates which can obscure positive test.
Antipyrine and Acetophenetidines	Antipyrine & Acetophenetidine Ingestion	Cherry red
Bilirubin	Hepatitis or Other Conditions with Increased Direct Reacting Billirubin	Green; moderately stable
Aceto-acetic Acid	Ketosis	Purple, red, fades quickly

TABLE 10—DIAGNOSTIC METHODS FOR HORMONAL DISORDERS

Hormone	Clinical Test	Assays	Chemical Determination	
			Urine	Blood
Pituitary Hormones				
HGH	Arginine tolerance Insulin Tolerance	Immunoassay on serum		
TSH	Response of I 137 uptake to TSH			
ACTH	Dexamethasone suppression of 17 OHCS. Metapirone effect on 17 OHCS	Bioassay		
FSH, LH		Immunoassay		
HCG		Pregnancy test Immunoassay		
Total Gonadotropins		Bioassay		
Thyroid Hormones	Serum Cholesterol, I 131 uptake, T3 suppresion test			T4 by colomn PBI, free thyroxin TBG

Hormone	Clinical Test	Assays	Chemical Determination	
			Urine	Blood
Adrenal Medullary Hormones Epinephrine and/or Norepinephrine	Histamine test, Regitine	Bioassay for epinephrine	Epinephrine and Norepinephrine VMA	Epinepherine and Norepineprine
Adreno Cortical Hormones Aldosterone	Serum Na, K. CO2, Cl. Responseto Na deprivation Response to aldactone	Na retention in adrenalectomized rats	Aldosterone	Aldosterone
Cortisol	Water load test Effect of ACTH on 17 OHCS Effect of dexamethasone on 17 OHCS Metapirone test.	Bioassay	17 OHCS 17 Ketogenic Steroids	17 OHCS Cortisol

Adrenal Androgens	Suppression by Dexamethasone of 17 KS	Bioassay	17 KS 11 OXY-17KS	17 KS
Testicular Hormones	Lack of suppression 17 KS by Dexamethasone	Bioassay	17 KS Testosterone	17 KS
Ovarian Hormones Estrogens	Vaginal smear or Biopsy. Endometrial biopsy		Estrogen	Estrogen
Progesterone	Endometrial biopsy Vaginal smear Basal temperature curve.	Bioassay	Pregnanediol	

TABLES OF NORMAL LABORATORY VALUES

CHEMISTRY

Nelson 1975, 10th Edition

Determination	Specimen	Age/Sex	Normal Value
Ammonia	Whole blood	Premature/jaundiced infant	100-200 ug/dl
		Newborn	90-150 ug/dl
		Newborn child	40/80 ug/dl
		Thereafter	20-120 ug/dl
Amylase (starch, 37 C)		Newborn	2-2500 IU/l
		Infant/child	160-3700 IU/l
		Thereafter	1200-3200 IU/l
			0.5-.1.5 mg/dl
Bilirubin, Total			Premature/full term
		Cord	2 2 mg/dl
		0-1 day	8 6 mg/dl
		1-2 day	12 8 mg/dl
		3-5 day	16 12 mg/dl
		Thereafter	2 1 mg/dl
Bilirubin, direct			0-1 mg/dl
Bromsulphalthacin, 5 mg/kg (BSP)			5% at 45 min

Calcium total		Newborn	3.7-7.0 mEq/l*
		Infant	5.2-6.0 mEq/ l
		Child	5.0-5.7 mEq/ l
		Thereafter	4.5-5.7 mEq/ l
Carbon dioxide, partial pressure (PCO)	Whole blood, arterial		35-45 mm Hg
	Whole blood venous		40-50 mm Hg
Chloride		Cord	96-104 mEq/1
		Newborn	93-112 mEq/1
		Infant	95-110 mEq/1
		Child	101-108 mEq/1
		Thereafter	98-108 mEq/1
Cholesterol, total		Cord	45-100 mg/dl
		Newborn	45-170 mg/d1
		Infant	70-175 mg/d1
		Child	120-240 mg/d1
		Thereafter	150-250 mg/d1
Cortisol			
AM specimen			15-25 ug/d1
PM specimen			5-10 ug/dP
		Male	0.2.06 mg/d1
Creatine		Female	0.6-1.0 mg/d1
Creatine phosphokinase (CPK)		Newborn	10-300 IU/1
		Thereafter	0-70 IU/1

Determination	Specimen	Age/Sex	Normal Value
(creatine phosphate, 30 C)			0-50 IU/1
Creatinine			0.3-1 1 mg/dl
Creatinine clearance (endogenous)	Serum and urine	Newborn	40-65 ml/min/1. 73 M
		Child	
		Male	98-150 ml/min/1. 73 M
		Female	95-120 ml/min/1. 73M
		Thereafter	
		Male	91-119 ml/min/1. 73M
		Female	77-113 ml/min/1. 73M
Electrophoresis, protein (cellulose acetate) (see protein)			

	Total Protein	Albumin	alpha 1-glob	alpha 2-glob	B-glob	gamma-glob	Units
Premature	4.3–7.6	3.1–4.2	0.10.5	0.3–0.7	0.3–1.2	0.3–1.4	g/dl
Newborn	4.6–7.4	3.6–5.5	0.1.0–3	0.3–0.5	0.2–1x	.221.2	g/dl
Infant	6.1–617	4.4–5.3	0.2–0.4	0.5–0fi	0.5–0.8	0.3–0.7	g/dl
Thereafter	6.2–8.1	4.0–5.k	0.1.:	0.4–.1.0	0G5–0.9	0.3–.10	g/dl
Fibrinogen					Newborn	150-300 mg/dl	
					Thereafter	200–400 mg/dl	

Glucose, fasting (FBS)	Premature	20–60 mg/dl
	Newborn	30–80 mg/dl
	Child	60–100 mg(/dl
	Thereafter	60–100 mg/dl
		70–100 mg/dl

Immunoglobulins	Gamma IgG. mg./dl	Gamma IgM mg/dl	Gamma IgA mg/dl	Total Ig mg/dl.
Newborn	645–1,244	5–30	0–11	600–1,439
1–3 mo	272–762	16–67	6–56	324–699
4–6	206–1,124	10–83	8–93	228–1,232
7–12	279–1,533	22–147	16–98	327–1,687
13–25	258–1,393	14–114	19–119	398–1,586
25–36	419–1,274	28–113	19–235	499–1,418
3–6 yr.	569–1,597	22–100	55–152	730–1,771
6–8 yr.	559–1,492	27–118	54–221	640–1,725
9–11 yr.	779–1,456	35–132	12–208	966–1,639
12–16 yr.	726–1,085	35–72	70–229	833–1,284
Adult	569–1,919	47–147	61–330	730–2,365
Iodine, total serum organic (PBI)			Newborn	4–14ug/dl
			6 wk:16 yr.	5–9 ug/dl
			Thereafter	4–8 ug/dl
Iodine, T-by-column (thyroxine)			Newborn	3–12 ug/dl
			Thereafter	3.4–6.2 ug/dl
Iron			Newborn	100–200 ug/dl

Determination	Specimen	Age/Sex	Normal Value
		4 mo–2 yr.	40–100 ug/dl
		Thereafter	85–150 ug/dl
Iron-binding capacity (IBC)		Newborn	60–175 ug/dl
		4 mo–2 yr	100–400 ug/dl
		Thereafter	350–450 ug/dl
Oxygen, partial pressure (PO2)	Whole blood, arterial		75–100 mm Hg
	w. blood, venous		20–50 mm Hg.
PH (37 °c)	Whole blood, arterial	Premature (cord)	7.15–7.35
		Newborn	7.27–7.47
		Thereafter	7.35–7.45
Phenylalanine			0.5–2.0 mg/d.
Phosphatase, alkaline arterial		Newborn	50–275 IY/1
(p-nitrophenylphospha		Infant	100–330 rt/)
AMP buffer, 37° C,		Child	90–230 IU/1
Auto-Analyser)		Adolescent	100–250 IU/L
		Thereafter	30–90 IU/L
Phosphorus		Newborn	3.5–8.6mg/dl
		Infant	4.5–6.7 mg/dl
		Child	4.5–5.5 mg/dl
		Thereafter	2.5–4.8 mg/dl
Potassium		Premature (cord)	5.0–10.2mEq/1

	Premature (48 hr)	3.0–6.0 mEq/l
	Newborn (cord)	5.6–12.0 mEq/l
	Newborn	5.0–7.7 mEq/l
	Infant	4.1–5.3 mEq/l
	Child	3.5–4.7 mEq/l
	Thereafter	3.4–5.6 mEq/l
Protein, total	Premature	4.3–7.6 gm/dl
	Newborn	4.6–7.6 gm/dl
	Child	6.2–8.1 gm/dl
	Thereafter	5.5–7.8 gm/dl
Sodium	Premature (cord)	116–140 mEq/l
	Premature (48 hr)	128–148 mEq/l
	Newborn (cord)	126–166 mEq/l
	Newborn	139–162 mEq/l
	Infant	139–146 mEq/l
	Child	138–145 mEq/l
	Thereafter	135–151 mEq/l
Transaminases	Newborn/infant	5–70 IU/l
Glutamic oxalacetic (GOT)		
Triglycerides	Newborn/infant	5–40 mg/dl
	Thereafter	10–190 mg/dl
Urea nitrogen (BUN)	Newborn/infant	5–15 mg/dl
	Thereafter	10–20 mg/dl
	Child	2.1–7.7 mg/dl
Uric acid	Thereafter	1.8–6.6 mg/dl

Determination	Specimen	Age/Sex	Normal value
	(urine unless otherwise indicated)		
Fat, fecal	feces		5 gm/24 hr
17-Ketosteroids (17-KS)		0–14 days	0.5–2.5 mg/24 hr.
		14 days–2 yr	0–0.5 mg/24 hr.
		2–6 yr	0–2.0 mg/24 hr.
		6-8 yr	0.7–4.0 mg/24 hr.
		10–12 yr Male	0.7–6.0 mg/24 hr.
		Female	0.7–5.0 mg/24 hr.
		12–14 yr. Male	1.3–10.0 mg/24 hr
		Female	1.3–8.5 mg/24 hr.
		14-16 Male	2.5–13.0 mg/24 hr.
		Female	2.5–11.0 mg/24 hr.
		Adult: Male	9.0–22.0 mg/24 hr.
		Female	6.0–15.0 mg/24 hr.
Protein, total (albumin)			2–8 mg/dl
			10–100 mg/24 hr.

CEREBROSPINAL FLUID

Determination	Specimen	Age–Sex	Normal Value
Cell count	C.S.F.		
		wbc's/mm	rbc's/mm
		Premature 0–18	0–500
		Newborn 0–15	0–500
		Infant 0–8	0–10
		Thereafter 0–5	0–10
Chloride		Neonatal	108–122 mEq/l
		Thereafter	112–130 mEq/l
Glucose		Newborn	20–40 mg/dl
		Infant/child	70–90 mg/dl
		Thereafter	50–80 mg/dl
Protein, total		Newborn	20–120 mg/dl
		Thereafter	15–45 mg/dl
Albumin			52%
Alpha 1			5%
Alpha 2			14%
Beta			10%
Gamma			19%

Determination	Specimen	Age/Sex	Normal Value
	(whole blood unless otherwise indicated)		
Hemoglobin		Newborn	14–24 gm/dl
		Neonatal	11–20 gm/dl
		Infant	10–15 gm/dl
		Child	11–16 gm/dl
		Thereafter	
		Male	14–18 gm/dl
		Female	12–16 gm/dl
Hemoglobin, fetal (Hb F)		Newborn	40-70% of total
		Neonatal	20–40% of total
		Infant	2–10% of total
		Thereafter	1–2% of total
Osmotic fragility			0.44–0.40 NaCl
50% hemolysis			0.5 NaCl

Platelet count	Premature	100–300 000/mm
	Newborn	140–300 000/mm
	Neonatal	150–390 000/mm
	Infant	200–400 000/mm
	Thereafter	150–450 000/mm
Red blood cell count (RBC)	Newborn	4.8–6.1 mil/mm
	Neonatal	4.1–6.4 mil/mm
	Infant Child	3.8–.5 mil/mm
	Thereafter	
	Male	4.6–6.2 mil/mm
	Female	4.2–5.4 mil/mm
Blood indices		
MCH	Newborn	32–34 uug
	Thereafter	27–31 uug
MCV	Newborn	76–108 uug
	Thereafter	82–91 uug
MCHC	Newborn	32–33%
	Thereafter	32–36%

Determination	Specimen	Age/Sex	Normal Value
Reticulocyte count		Newborn	2.5–6.5% total RBC
		Neonatal	0.1–1.5% Total RBC
		Infant	0.5–3.1% total RBC
		Thereafter	0–2.0% total RBC
Sedimentation rate (ESR) (uncorrected)		Newborn	0–2 mm/hr
		Neonatal/puberty	3–13 mm/hr
		Adult : Male	10–15 mm/hr
		Female	15–25 mm/hr
White blood cell count (WBC)		Newborn, total	9,000–30,000/mm
		% neutrophiles	— 61%
		% lymphocytes	— 31%
		1 wk. total	5,000–21,000/mm
		% neutrophiles	— 45%
		% lymphocytes	— 41%
		4 wk. total	5,000–19,500/mm
		% neutrophiles	— 35%
		% lymphocytes	— 56%

		6–12 mo. total	6,000–17,50/0ωιυ
		% neutrophiles	— 32%
		% lymphocytes	— 61%
		2 yr. total	6,200–17,000/mm
		% neutrophiles	— 33%
		% lymphocytes	— 59%
		Thereafter, total	5,000-10,000/mm
		% neutrophiles	— 60%
		% lymphocytes	— 30%
		COAGULATION	
Bleeding time (Ivy)	Whole blood	Premature	1–8 min
		Newborn	1–5 min
		Thereafter	1–6 min
Clotting time	whole bood		
2 tubes			5–8 min
3 tubes			5–15 min
Fibrinogen	plasma	Newborn	150–300 mg/dl
		Thereafter	200–400 mg/dl
Partial thromboplastin time (PTT)	plasma	Premature	120 sec
		Newborn	90 sec
		Thereafter	60 sec
Prothrombin time one stage (PT)	plasma	Premature	12–21 sec
		Newborn/neonatal	12–20 sec
		Thereafter	12–14 sec

SEROLOGY

ASO titre Recent strep infection		72–100 total units 200–2500 Total units
Febrile agglutinins		
Typhoid O		0–1 : 40
Typhoid H		0–1 : 20
Brucella		0–1 : 20
Rickettsia (Proteus OX 19)		0–1 : 40
Tularemia		0–1 : 40

URINALYSIS

pH	Newborn/neonatal	5 — 7
	Thereafter	4.5–8
Specific gravity	Newborn/infant	1.001–1.020
	Thereafter	1.001–1.030
Volume	Newborn	30–300 ml/24 hr
	Neonatal	250–450 ml/24 hr
	Infant	400–600 ml/24 h
	Child	500–1000 ml/24 hr
	Adolescent	500–1500 ml/24 hr
	Adult	500–2000 ml/24 hr.

Table 11—RECOMMENDED DAILY ALLOWANCES OF CALORIES AND SOME ESSENTIAL NUTRIENTS

(Nutrition Advisory Committee of the Indian Council of Medical Research, 1966).

CHILDREN

Ages	Net Calories	Proteins gms. gms/kg.	Calcium Ca gms	Iron Fe mg.	Vit.A I.U.	Vit. D2 I.U.	Thiamin Vit. B1. mg.	*Riboflavin* Vit. B2 mg.	*Nicotinic* Acid mg.	Ascorbic Acid Vit. C mg.
0- 6 m	120/kg	3.5	1-1-15	10-30	3000-4000	400-800	0.5-1	0.75-1.5	5-10	30-50 & over
7-12 m	100/kg	3.5	,,	,,	,,	,,	,,	,,	,,	,,
1- 3 y	1200	3.5	,,	,,	,,	,,	,,	,,	,,	,,
4- 5 y	1500	3.5	,,	,,	,,	,,	,,	,,	,,	,,
5- 6 y	1500	3	,,	,,	,,	,,	,,	,,	,,	,,
6- 7 y	1800	3	,,	,,	,,	,,	,,	,,	,,	,,
7- 9 y	1800	2.5	,,	,,	,,	,,	,,	,,	,,	,,
9-12 y	2100	2.5	,,	,,	,,	,,	,,	,,	,,	,,

Table 12

Choice of Antimicrobial Agents—Intended as rough guidelines only

I. Gram Positive COCCI	Drug	Infection	Daily Adult Dose	Pediatric Dose (If different)
Group A Streptococcus AlwaysRx for 10 days to prevent post infection sequelae.	Penicillin G Alt. Erythromycin Cephalothin Clindamycin	Pharyngitis Cellulitis, Pneumonia Empyema Bacteremia	400,000 units (250 mg) 1.2 m.u./d. 4-6 m.u./d.	25,000 u/kg/d 25,000-50,000 u/kg/d 100,000 u/kg/d.
Streptococcus Viridans Strep. Faecalis	Penicillin G (Alt. seel) Penicillin+Streptomycin Alt. Chloramphenicol.	SBE	10-20 m.u./day. v. x4 wks	250,000 u/kg/d.
Entero Coccus	Penicillin G or Ampicillin plus and Aminoglycoside	SBE Rx. 4 6 wks.	20 m. u./d. 8g/d. 3 mg/kg/d. (Gentamicin)	250,000 u/kg/d. 300 mg/kg/d.

Gram Positive COCCI	Drug	Infection	Daily Adult Dose	Pediatric Dose (If different)
Pneumococcus	Penicillin G	Pneumonia	1.2 m.u./d x5-7	25,000 u/kg/d.
	Alt. (See 1)	Meningitis	days 20 m.u./d x	250,000 u/kg/d
		Complications (Empyema)	d x 10-14 days	100,000 u/kg/d.
Staph. Aureus	Penicillin G.	Abscess	1.2 m.u./d	25,000 u/kg/d
Penicillin sensitive)		Endocarditis	20 m.u./d	250,000 u/kg/d
		Pneumonia	2-4 m.u./d	100,000 u/kg/d
Staph Aureus (Penicillin resistant)	Semisynthetic Penicillin	Mild Infection	1-2 g/d (dicloxacillin)	25-50 mg/kg/d
	Alt. Cephalothin, Erythromycin, Clinamycin Chloromycetin Cloxacilin	Severe Infection	12-16g/d (methicicillin) 6-12 g/d (nafcillin, oxacillin)	300 mg/kg/d 200-300 mg/kg/d
II. GRAM POSITIVE BACILLI				
Clostridium Perfringens	Penicillin G	Gas Gangrene	(a) 10-20 m.u./di.v	250.000 u/kg/d
	Alt. Chloramphenicol		(b) 2-4g/dav,iv.v Use of antitoxin (horse) hemolysis is debatable,	100 mg/kg/d in the absence of Hyperbaric O_2 may be needed

Clostridium Tetani	Penicillin G Alt. Tetracycline		2-4 m.u./d Human antitoxin 250 units	100,000 u/kg/d
Listeria Monocytogenes	(a) Ampicillin Alt. Erythromycin, Tetracycline Chloramphenicol	Meningitis	(a) 8-12 /g/d	300 mg/kg/d
Corneybacterium Diphtherja	Penicillin G Alt. Erythromycin.		1.2 m.u./day plus anititoxin (horse) 20,000-100,000 units.	25,000 u/kg/d
III. GRAM NEGATIVE COCCI				
Meningococcus	Penicillin G Alt. Chloramphenicol Ampicillin	Meningitis	10-20 m.u./day i.v. x 7 days.	250,000 u/kg/d
	Erthromycin	Meningococcemia	6-10 m.u./day x 7	150,000 u/kg/d.

Gram Negative COCCI	Drug	Infection	Daily Adult Dose	Pediatric Dose (If different)
Gonococcus	Penicillin G	Gonorrhea	Males :	
	Alt. Spectinomycin Tetracycline Ampicillin, Erythromycin		2.4 m.u. penicillin 2 gm Spectinomycin 2 g/d x 5 Tetracycline Females 4.8m.u.penicillin 4g Spectinomycin 2g/d xs Tetracycline	

IV. GRAM NEGATIVE BACILLI–Since sensitivity patterns vary, antibiotic choice should be based on specific sensitivity determination whenever possible.

E Coli	(a) Sulfasoxazole (Gantrisin)	Urinary Infection	(a) 4g.loading dose 2g.q.i.d. x 10 days	50-150mg/kg/d
	(b) Trisulfapyrimidines (Triple Sulfa)		(b) 3-4g.loading dose 1 g.q.i.d.,p.o.	50-100mg/kg/d
	(c) Ampicillin		(c) 2-4 g./d.	50-100mg/kgd.
	(a) Ampicillin	Surgical Wounds	(a) 4-8 g./d.	200 mg/kg/d.
	(b) Cephalothin	Pneumonia,	(b) 4-8 g./d.	250 mg/kg/d.
	(c) Chloramphenicol	Sepsis	(c) 2-4 g./d	100 mg/kg/d.

	(d) Kanamycin		(d) 15 mg./kg/d Max 1-1-5g/d)	
	(e) Gentamicin		(e) 3 mg /kg/d (max 5mg/kg/d)	
Klebsiella	(a) Kanamycin		(a) 15 mg/kg/d (max 1-1.5g/d	
	(b) Cephalothin Alt Gentamicin, Chloramphe-nicol, Colistin		(b) 4-8 g/d)	250 mg/kg/d
Enterobacter	(a) Gentamicin or (b) Chloram-phenicol Alt. Kanamycin, Tetracycline, Colistin, Carbe-nicillin		(a) 3 mg/kg/d (max mg/kg/d) (b) 2-4 g/d	100 mg/kg/d
Proteus Mirabilis	Ampicillin Alt. Cephalothin	Urinary Tract infection	2-4 g/d.	5-0100 mg/kg/d

Gram Negative Bacilli	Drug	Infection	Daily Adult Dose	Pediatric Dose (If different)
	Gentamicin Kanamycin			
Proteus Indole-	Kanamycin,		15 mg/kg/d	
Positive	Alt. Gentamicin Chloramphenicol Streptomycin		(max. 1-1.5 g/d)	
Pseudomonas	(a) Gentamicin		(a) 3 mg/kg/d	
Aerugenosa			(max. 5mg/kg/d)	
	(b) Carbenicillin		(b) 24-36 g/d	400-500mg/kg/d
	Alt. Colistime- thate			400-500mg/kg/d
Salmonella	Chloramphenic Ampicillin.		2-4 g/d (when treat- ment indicated)	100 mg/kg./d.
Serratia	Gentamicin		3 mg/kg/d	
	Alt. Kanamycin,		(max. 5 mg./kg./d)	
	Chloramphe- nicol Carbenicillin		2-4 g/d	50-100 mg/kg/d.
Shigeila	Ampicillin		2-4g/d	50-100 mg/kg/d.
	Alt. Chloramphenicol Tetracycline, Kanamycin Keflin.			

Bacteroides.	Penicillin G.	Respiratory	4-6 m.u./d.	100,000 u/kg d
	Chloramphe-	Infections	2-4 g/d.	100 mg/kg/d
	nicol Clindamy-	Gastrointestinal	1.8 g/d.	25 mg/kg/d
	cin Alt. Tetracyc-	Infections		
	line Ampicillin.			
Pasteurella	Penicillin G.		1.2 m.u./d.	25,000 u/kg/d.
Multocida	Alt. Tetracycline			
Hemophilus				
Influenza	Ampicillin	UrinaryInfection	2-4 g/d.	50-100 mg/kg/d
	Alt. Chloram-	Meningitis	8-12 g/d	300 mg/kg/d.
	pnenicol Strept.,			
	Tetra.			
Miscellaneous				
Syphilis (Primary	Penicillin G.		(a) Benzathene Pencillin 2.4 m.u. in	
& Secondary)	Alt. Erythro-		single dose	
	mycin, Tetra-		(b) Procaine Pen 600,000 u.i.m.x	
	cycline.		8-10 days	
Neurosyphilis	Penicillin G.		(a) Benzathene Penicillin 2.4 m.u.,i.m. 7 d x 3	
Klebsiella	Gentamycin		(b) Procaine Pen. 600,000 m.u.i.m.	
Antibiotics	Kanamycin,		qd. x 14	

Attempts to medically "autoclave" patients with broad antibiotic prophylaxis are generally unsuccessful and carry the risks of superinfection, toxicity, and allergy. Specific therapy for a specific organism is the basic axiom of prophylaxis. and treatment.

Table 13

Some Situations Where Prophylactic Antimicrobial Drugs May Be Useful

Infections	Drug	Dose
1. Streptococcal (Group A) infection, Rheumatic fever	Penicillin Sulfonamide Alt. Erythromycin.	(a) 900,000 units, benzathine penicillin G.m.q. 3-4 wks. (b) 200,000 units penicillin G b.i.d. p.o.
2. Meningococcal Infection no method uniformly effective	(a) Sulfonamides for sensitive strains (b) Penicillin.	(a) 2g. bid. x 2 days. (b) 400,000 u.p.o. quid.
3. Syphilis	Penicillin	2-4 million units procaine benzathine penicillin G.i.m.
4. Gonorrhea	Penicilin Alt. Spectinomycin Ampicillin, Tetracycline.	2-4 million units procaine penicillin i.m. (test VDRL q. 3 mo. for 1 year.)
5. Prevention of Bacterial Endocarditis		
a) Streptococcus viridans	a) Penicillin	a) 600,00 units acqueous and 600,000 units of procaine penicillin 1 hour before. 600,000 units procaine penicillin for two days after dental extraction.

b) Enterococcus	b) Ampicillin & Gentamicin.	0.5 gm orally one hour before urinary tract manipulation and every 6 hours for 2 d. after. 1 mg/kg in q8 hr. for same period.
6. Tuberculosis	Isoniazid	0.3 g. each day x 12-24 mon.
7. Urinary tract infection in patients with indwelling catheters	Neomycin plus polymyxin	Constant bladder rinse via triple lumen catheter. (1 liter per day) Neomycin 40 mg/L Polymyxin 20 mg/L
8. E coli newborn diarrhea	Neomycin	50-100 mg/kgday p.o.
9. Grossly contaminated injury including bites	Penicillin	1.2-2.4 m.u./day
	Tetanus toxoid	0.5 cc. imm. when indicated
10. Intravenous Polyethylene catheter-cutdown (avoid when possible)	Soap & water	Plenty
	Neomycin plus Polymyxin	Topical ointment to entry site

Table 14

Mean Weight and Heights of Average Indian Children (I.C.M.R. Data)

Age	BOYS		GIRLS	
	Weight in kg.	Height in cms.	Weight in kg.	Height in cms.
Upto 3 months	4.5	56.2	4.2	55.0
4 — 6 months	6.7	62.7	5.6	60.9
7 — 9 months	6.9	64.9	6.2	64.4
10 — 12 months	7.4	69.5	6.6	66.7
1 year	8.4	73.9	7.8	72.5
2 years.	10.1	81.6	9.6	80.1
3 years.	11.8	88.6	11.2	87.2
4 years.	13.5	96.0	12.9	94.5
5 years.	14,8	102.1	14.5	101.4
6 years.	16.3	108.9	16.0	107.4
7 years.	18.0	113.9	17.6	112.8
8 years.	19.7	119.3	19.4	118.2
9 years.	21.5	123.7	21.3	122.9
10 years.	23.5	128.4	23.6	128.4
11 years.	25.9	133.3	26.4	133.6
12 years.	28.5	138.3	29.8	139.2

Table 15

Age	BOYS	GIRLS
	Head Circumference cms.	Chest Circumference cms.
Upto 3 months	38.6	36.0
4 — 6 months	41.3	39.4
7 — 9 months	42.6	41.1
10 — 12 months	43.7	42.2
1 year	44.4	43.3
2 years	45.9	45.8
3 years	47.4	48.0
4 years	48.0	49.4
5 years	48.5	50.8
6 years	49.0	52.5
7 years	49.4	54.2
8 years	49.9	55.5
9 years	50.1	57.3
10 years	50.4	59.1
11 years	50.7	60.4
12 years	51.1	62.9

Table 16 — GROWTH AND DEVELOPMENT (Modifed-Nelson)

EMERGING PATTERNS OF BEHAVIOUR DURING THE FIRST YEAR OF LIFE

NEONATAL PERIOD (FIRST 4 WEEKS)

Prone: Lies in flexed attitude; turns head from side to side; head sags on ventral suspension.

Supine: Generally flexed and a little stiff

Visual: May fixate face or light in line of vision; "doll's-eye" movement of eyes on turning of the body.

Reflex: Moro response active; stepping and placing reflexes; grasp reflex active

AT 4 WEEKS

Prone: Legs more extended; holds chin up; turns head; lifted momentarily to plane of body on ventral suspension.

Supine: Tonic neck posture predominates; supple and relaxed; head lags on pull to sitting position.

AT 8 WEEKS

Prone: Raises head slightly farther; head sustained in plane of body on ventral suspension.

Supine: Tonic neck posture predominates; head lags on pull to sitting position.

Visual: Follows moving object 180 degrees..

Social: Smiles on social contact; listens to voice and coos

AT 12 WEEKS

Prone: Lifts head and chest, arms extended; head above plane of body on ventral sus pension.

Supine: Tonic neck posture predominates; reaches, toward and misses objects; waves at toy

Sitting: Head lag partially compensated on pull to sitting position; early head control with bobbing motion; back rounded.

Reflex: Typical Moro response has not persisted; makes defense movements or selective withdrawal reactions.

Social: Sustained social contact; listens to music; says "aah, ngah"

AT 16 WEEKS

Prone: Lifts head and chest, head in approximately vertical axis; legs extened.

Supine: Symmetrical posture predominates; hands in midline; reaches and grasps objects brings them to mouth.

Sitting: No head lag on pull to sitting position; head steady, held forward enjoys sitting with full truncal support.

Standing: When held erect, pushes with feet.

Adaptive: Sces pelet, but makes no move to it

Social: Laughs out loud; may show displeasure if social contact is broken exicted at sight of food.

AT 28 WEEKS

Prone: Rolls over; may pivot

Supine: Lifts head; rolls over; squirming movements.

Sitting: Sits briefly, with support of pelvis; leans forward on hands; back rounded.

Standing: May support most of weight; bounces actively.

Adaptive: Reaches out for and grasps large object; transfers objects form hand to hand; grasp uses radial palm; rakes pellet.

Language: Polysyllabic vowel sounds formed

Social: Prefers mother; babbles; enjoy mirror; response to changes in emotional contact social contact.

AT 40 WEEKS

Sitting: Sits up alone and indefinitely without support, back straight

Standing: Pulls to standing position

Motor: Creeps or crawls.

Adaptive: Grasps objects with thumb an forefinger: pokes at things with forefinger; picks up pellet with assisted pincer movement; uncovers hidden toy; attempts to retrieve dropped object; releases object grasped by other person.

Language: Repetitive consonant sounds (mama, dada)

Social: Responds to sound of name; plays peek-a-boo or pat-a-cake; waves bye-bye.

AT 52 WEEKS (1 YEAR)

Motor: Walks with one hand held; "cruises" or walks holding on to furniture.

Adaptive: Picks up pellet with unassisted pincer movemen of forefinger and thumb; releases object to other person on request or gesture.

Language: 2 "words" besides mama, dada.

Social: Plays Simple ball game; makes postural adjustment to dressing.

Motor: Walks alone; crawls up stairs.

Adaptive: Makes tower of 2 cubes; makes a line with crayon; inserts pellet in bottle.

Language: Jargon; follows simple commands; may name a familiar object (ball))

Social: Indicates some desires or needs by pointing.

18 MONTHS

Motor: Runs stiffly; sits on small chair; walks up stairs with one had held; explores drawers and waste baskets.

Adaptive: Piles 3 cubes; imitates scribbling; imitates vertical stroke; dumps pellet from bottle.

Language 10 words (average); names pictures.

Social: Feeds self, seeks help when in trouble; may complain when wet or soiled.

24 MONTHS

Motor: Runs well; walks up and down stairs, one step at a time; opens doors; climbs on furniture.

Adaptive: Tower of 6 cubes; circular scribbling; imitates horizontal stroke; folds paper once imitatively.

Language: Puts 3 words together (pronoun, verb, object)

Social: Handles spoon well; often tells immediate experiences; helps to undress; listens to stories with pictures.

30 MONTHS

Motor: Jump

Adaptive: Tower of 8 cubes; makes vertical and horizontal strokes, but generally will not join them to make a cross; imitates circular stroke. forming closed figure.

Language: Refers to self by pronoun "I"; knows full name.

Social. Helps put things away.

36 MONTHS

Motor: Goes up stairs alternating feet; rides tricycle; stands momentarily on one foot.

Adaptive: Tower of 9 cubes; imititates construction of "bridge" of 3 cubes; copies a circle; imitates a cross.

Language: Knows age and sex; counts 3 objects correctly; repeats 3 numbers or a sentence of 6 syllables.

Social: Plays simple games (in "parallel" with other children); helps in dressing (unbuttons clothing and puts on shoes); washes hands.

48 MONTHS

Motor: Hop's on one foot; throws ball overhand; uses scissors to cut out pictures; climbs well.

Adaptive: Copies bridge from model; imitates construction of "gate" of 5 cubes; copies cross and square; draws a man with 2 to 4 parts besides head; names longer of 2 lines.

Language: Counts 4 pennies accurately; tells a story.

Social: Plays with several children with beginning of social interaction and role:playing; goes to toilet alone.

60 MONTHS

Motor: Skips

Adaptive: Draws triangle from copy; names heavier of 2 weights

Language: Names 4 colors sentence of 10 syllables; counts 10 pennies correctly.

Social: Dresses and undresses; asks questions about meaning of words; domestic role-playing.

After 5 years the Standford-Binet, Wechsler-Bellevue and other scales offer the most precise estimates of developmental level. In order to have their greatest value, they should be administered only by an experienced and qualified person.

Table 17—NORMAL PATTERN OF SEXUAL MATURATION

Approximate Age years	Sexual characteristics		Status of Hormone Production
	Boys	Girls	
3–7	Infantile	Infantile, Vaginal pH alkatine	Very small amounts of 17-K's (both sexes) and oestrogens (females) in urine.
7–9	—	Uterus begins to grow	Estrogens and 17-K's begin to increase
9–10	—	Growth of bony pelvis starts. Budding of nipples	
10–11	Increased vascularity of penis and scrotum	Budding of breasts May be unilateral at first. Public hair appears	Estrogen excretion gre crease in the female.
11–12	Prostatic activity; Public hair appears	Cornification of vaginal epithelium;	Gonadotropins demonstrable in urine (both sexes)

		Vaginal pH-acid, Growth of genitalia.	Estrogen excretion cyclic (female)
12–13	Rapid growth of Testes and penis Testes and penis	Axillary hair. Menarche (average 13.5 yrs) Anovulatory mestruation	
13–15	Axillary hair; Down on upper lip, Voice change	Earliest normal pregnancies	Pregnanediol in urine during luteal phase (female).
15–16	Mature spermatozoal (average 15 yrs; range 11-17 yrs.)	Acne	—
16–17	Acne	End of skeletal growth	
17–21	End of skeletal growth	—	

Table 18—Volume and Electrolyte Content of Fluid Losses

Secretion (Average 24 hr. with range)	Na mEq/L	K mEq/L	Cl mEq/L	HCO3 mEq/L	Volume ml.
Gastric juice high in acid	20 (10-30)	10 (5-40)	120 (80-150)	0	1000-9000
Pancreatic juice	140 (115-180)	(3-8)	75 (55-95)	80 (60-110)	500-1000
Bile	148 (130-160)	5 (3-12)	100 (90-120)	35 (30-40)	1000-3000
Small bowel drainage	110 (80-150)	5 (2-8)	105 (90-120)	30 (20-40)	1000-3000
Diarrhoeal stools	120 (20-160)	25 (10-40)	90 (30-120)	45 (30-50)	500-17,000
Burns	140	5	110	—	—

Table 19

PROBABLE DEFICITS OF WATER AND ELECTROLYTES IN INFANTS WITH SEVERE DEHYDRATION

(10—12 PER CENT)

Condition	H_2O ml/kg	Na Eq/Kg	K mEq/Kg	Cl mEq/Kg
Fasting and thirsting	100—120	5—7	1—2	4—6
Diarrhoea				
Isotonic	100—120	8—10	8—10	8—10
Hypertonic	100—120	2—4	0—4	2—4
Hypotonic	100—120	10—12	8—10	10—12
Pyloric stenosis	100—120	8—10	10—12	10—12
Diabetic acidosis	100—120	8—10	5—7	6—8

Correction of Persistent Symptomatic Disturbances of Electrolyte Concentration

Formula: (CD—CA) x fF x Wt in Kg—mEq required.

CD—concentration desired (mEq/L); CA—concentration present (mEq/l)

fD — apparent distribution factor as fraction of body weight

Electrolyte	Apparent Distribution Factor (fD)
Bicarbonate	0.4—0.5
Chloride	0.2—0.3
Sodium	0.6—0.7

Table 20

PROBABLE DEFICITS OF WATER AND ELECTROLYTES IN INFANTS WITH SEVERE DEHYDRATION (10—12 PER CENT)

Condition	H_2O ml/kg	Na Eq/Kg	K mEq/Kg	Cl mEq/Kg
Fasting and thirsting	100—120	5—7	1—2	4—6
Diarrhoea				
Isotonic	100—120	8—10	8—10	8—10
Hypertonic	100—120	2—4	0—4	2—4
Hypotonic	100—120	10—12	8—10	10—12
Pyloric stenosis	100—120	8—10	10—12	10—12
Diabetic acidosis	100—120	8—10	5—7	6—8

Correction of Persistent Symptomatic Disturbances of Electrolyte Concentration

Formula: (CD—CA) x fF x Wt in Kg—mEq required.

CD—concentration desired (mEq/L); CA—concentration present (mEq/l)

fD — apparent distribution factor as fraction of body weight

Electrolyte	Apparent Distribution Factor (fD)
Bicarbonate	0.4—0.5
Chloride	0.2—0.3
Sodium	0.6—0.7

Table 21-Incubation Periods and Isoatien Periods for some Common Contagious Diseases.

Disease	Duration of Average Incubation Period	Isolation of Patient	Observation or Quarantine of Susceptible Patients
Chicken-Pox	12–16 Days	Until pustules and most scabe gone, usually about 7 days	11–17 days from first exposure.
Diphtheria	First week, usually 2-4 days	Until two successive negative cultures of onse & throat are obtained, taken, no less than 24 hours apart, not before 7th day.	Observation for 7 days from contact or unti negative culture is obtained. Schick test for all contact.
Rubeolla	Second week, usually about 10 days	Until five days after appearance of rash	Observation 14 days from last exposure.
Mumps	Third week	Duration of swelling	Observation during 3rd week from 1st exposure.
Poliomyelitis	7–1p days	Duration of febrile period	Observation for 2 weeks for any minor illness.

Disease	Duration of Average Incubation Period	Isolation of Patient	Observation or Quarantine of Susceptible Patients
Rubella	Irregular, usually 3rd week	Duration of Catarrh a and rash	Observation 12--20 days.
Small-pox	2nd wek. usually about 12 days	Until all crusts and scabs are gone.	Quarantine 3 weeks. Rules modified by vaccination.
Pertussis	Beginning of 2nd week	Until one week after last paroxysm.	For two weeks from last exposure. Quarantine for unvaccinated under 5 years.
Meningococcus Meningitis	1st week	1st 24hours of effective antibiotic therapy	Observation for 7 days from last exposure
Cholera	1 -3 days		
Influenza	1.5 -2 days		
Typhoid	8- -16 days		
Tetanus	5 -35 days		
Rabies	30- -60 days	period of illness	

Table 22

Calculation of Body Surface Area (B.S.A. in sq. meters) from height (cm.) and weight (kg.

CHILDREN

Height (cms.)	WEIGHT (kg.)															
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
45	.15	.18	.21	.23												
50	.16	.20	.22	.24	.26	.28										
55	.18	.21	.24	.26	.28	.30	.32									
60		.22	.25	.28	.30	.32	.34	.36	.37							
65			.27	.29	.32	.34	.36	.38	.39	.41	.43					
70				.31	.34	.36	.38	.40	.42	.43	.45	.47				
75					.35	.38	.40	.42	.44	.46	.47	.47	.50	.52		
80					.37	.39	.42	.44	.46	.48	.50	.51	.53	.55	.56	.58
85						.42	.44	.46	.48	.50	.52	.54	.55	.57	.57	.60
90							.45	.48	.50	.52	.54	.56	.58	.59	.61	.63
95								.50	.52	.54	.56	.57	.60	.62	.63	.65
100									.54	.56	.58	.60	.62	.64	.66	.68
105										.58	.60	.62	.64	.66	.68	.70
110											.62	.65	.67	.69	.71	.72
115												.67	.69	.71	.73	.75
120													.71	.73	.75	.77
125														.75	.77	.79
130															.79	.82
135																.84

FOOD VALUES OF COMMON PREPARATION

(L.T.M.G. Hosp.—Dietary Dept.)

Name of preparation	Quantity	Weight/ Measure	Calories	Fat	Protein	C.H.O.
Rice (cooked)	one wati	110 gm.	105	—	2.1 gm.	
Chappati (without ghee)	one	30 gm.	90	—	2.4 gm.	
Bread (thick)	one slice	20 gm.	50	—	1.5 gm.	
Bhakar (Jowar)	one	280 gm.	600	—	18 gm.	
Bhakar (Bajri)	one	250 mg.	610	—	20 gm.	
Dhal (mung, masure, tur, etc).	one wati	30 mg.	100	3 gm.	7 gm.	18 gm
Idli	one piece	40 gm.	65	—	21. gm.	
Sambhar	one wati	75 ml.	75	—	3.1 mg.	
Bhindi Veg.	1 serving	100 gm.	100	6.5 g,m	2.3 gm.	8 gm.
Palak Baji	one wati	85 gm.	175	—	3.4 gm.	
Potato Baji	1/2 wati	120 gm.	157	3.5 gm.	1.5 gm.	30 gm.
Ladu (Rawa)	one	40 gm.	175	—	2.1 gm.	

Name of preparation	Quantity	Weight/ Measure	Calories	Fat	Protein	C.H.O.
Ladu (Besan)	one	30 gm.	140	—	2.8 gm.	
Tea	one cup	140 m.l.	62	—	1 gm.	
Sheera	one wati	120 gm.	355	—	5.2 gm	
Jilebi	one	18 gm.	100	—	7 gm.	
Banana	1 Small	100 gm.	80	—	—	20 gm.
Mango	1 small	140 gm.	80	—	—	20 gm.
Orange	1 small	10.0 gm.	40	—	—	10 gm.
Apple	small (2" diameter)	80 gm.	40	—	—	10 gm.
Oil	1 tea spoon	5 gm.	45	5 gm.	—	
Ghee	1 tea spoon	5 gm.	45	5 gm.		
Butter	1 tea spoon	5 gm.	45	5 gm.		

Beef, fowl, liver. pork, ham.	5–6 pieces	30 gm.	75	5 gm.	7 gm.	
Fish	2 pieces	70 gm.	75	5 gm.	7 gm.	
Peanut butter	2 tablespoon	130gm.	75	5 gm.	7 gm.	
Cheese	one oz.	30 gm.	75	5 gm.	7 gm.	
Egg	One	50 gm.	75	5 gm.	7 gm.	
Coca Cola	1 bottle	170 m.l.				200 gm.
Omlette	one	50 gm.	207	17.5 gm.	7.8 gm.	4.4 gm.
Ice Cream (Plain)	3/4 wati	360 gm.	402	18 gm.	8 gm.	50 gm.
Groundnut Chiki	2 pieces	50 gm.	333	16 gm.	13 gm.	47 gm.
Bread Pudding	1 serving	1.6 oz.	104	6 gm.	4.25 gm.	11.75gm
Custard	1 plate	1.2 oz.	109	1.2 gm.	9 gm.	23.7 gm.
Halwa	1 serving	4 oz.	442	241 gm.	7.2 gm.	49 gm

DRUG INDEX

(Selected from Nelson 75, 10th Edition).

NAME	DOSAGE, ROUTES	CONTRAINDICATIONS
1. Ascorbic Acid Tab. 100, 500 mg Sol 100,250 mg/ml. Drops 50 mg/0.6 ml.	50–300 mg.	Ascorbic Acid and Penicillin are incompatible
Adrenergics		
2. Ephedrine—Tab 15.30 Liq.—20mg/5ml.	3mg/kg./24 hrs.	Adverse reactions : Insomnia, headache, palpitation. urinary retention.
3. Adrenaline—Amp 1 : 1000	0.01 ml/kg/dose max 0.5 ml.	use with caution in C.V.S. disease; do not use if colour-changes to brown.
Analgesics		
4. Morphine Sulphate 10.15 mg/ml.	0.1–0.2mg/Kg/dose S.C.	
5. Aspirin Tab 75,300, 500 mg.	65 mg/kg/24 hrs.	Salicylism in infants. G. I. bleeding and gastric irritation
Antihelmenthics		
6. Diethylcarbamizine Tab 50, 100 mg. Syrup 50mg/5ml.	Tropical Eosinophilia 6 mg/kg/24 hrs. Helmenthiasis 15 mg/kg/25 hrs.	

7. Piperazine—Tab 250,500 mg Syrup 500mg/5ml.	50–75 mg/kg.	Vomiting, blurred vision,—muscle weakness.
8. Thiabendazole Tab. 500mg Syrup 500 mg.	50mg(kg/24hrs.,divided into two doses	G.I. symptoms, dizziness, headache vomitting, pruritis, fatigue
9. Pyrvinum Pamoate Lab 50mg. 50mg/5ml.	5mg/kg	Colours stools red, G.I symtoms.
10. Alcopar Granules 5 gm.	2.5–5 gm.	G.I. symptoms
Antibiotics		
11. Cephaloridine	30–50mg/kg/24 hrs in mild infections 100mg/kg/24 hrs, in severe infection	Do not mix with other antibiotics, protect from light, contraindication : hypersensitivity patient, and severe retinal damage.
12. Chloramphenicol Cap. 250mg Liq. 125mg/5ml. Inj. 100mg/ml.	50–100–mg/kg.	Aplastic annaemia, grey baby syndrome

NAME	DOSAGE, ROUTES	CONTRAINDICATIONS
13. Erythromycin		
250, 500 mg. Susp 100, 125mg/5ml.	30–50 mg/kg.	Use with care in liver disorders
14. Gentamycin		
Inj. 40mg/ml.	3–5mg/kg. in infants 6mg/kg : divide into 2 doses/infants; 3 doses/older children.	Nephrotoxicity, Ototoxicity
15. Kanamycin		
Inj. 500mg. 1mg/visal	15 mg/kg in new-borns, 6 mg/kg in older children.	Nephrotoxicity, Ototoxicity, skinrash, fever, headache, parasthesia
16. Lincocin		
Cap 250, 500 mg.	30–60 mg/kg.	Contraindication : hypersensitivity under 1 month age.
17. Neomycin		
Cap 350, mg. Susp 50 mg.	50 mg/kg	Contraindication : hypersensitivity, intestinal obstruction, in combination with nephrotoxic drugs.

18. Ampicillin Cap 250, 500 Susp 125, 250 mg/4ml. Inj. 0.5, 1 gm.	50–100mg/kg-moderate for inf,: 100-200mg/kg severe infection; 400 mg/kg. severe infection	Contraindication : Sensitivity to Penicillin, Inf. Mononucleosis
19. Carbenicillin Tab 382 mg. So . 1gm. 5gm Inj.	Parental 50–400mg/kg depending on severitv	Hypersensitivity G. I. Blood, Hepatic disorder
20. Cloxacillin Cap 250 mg. Oral Sol 125 mg/5ml	50–100mg/2kg	G. I. Hypersensitivity
21 Penicillin G Benzathine 6 lacs, 1.2 and 2.4 million units/vial Benzyl Penicillin 5 lacs/vial	0.6–1.2 million units newborn:60,000 units/ kg, divide into 2 doses older children:25-50,000 units/kg. divide in 4–6 doses Severe infection : 2–4 lacs/kg in 4–6 doses	 hypersensitivity and fatal anaphylaxis

NAME	DOSAGE, ROUTES	CONTRAINDICATIONS
Procaine Penicillin 4 lacs/vial Penicillin V Tab. 65mg. 125mg. (2 lacs) 250mg. Susp 125mg/5ml.	2—4 lacs 25–50,000 units/kg.	
22. Polymyxin B	Enteric Infections : 10–20mg/kg/24hrs; orally Systemic infections : 1.5–2 mg/mg/kg/24 hrs. I. M.	Nephrotoxic, neurotoxic, fever rash, dizziness
23. Streptomycin Vial 0.5 & 1gm.	20–40mg/kg/24 hrs.	Vestibular damage, nephrotoxic, skin-rash
24. Rifampin Cap 300 mg	10–20mg/kg/24 hrs. single dose (not to exceed 600mg.	Hypersensitivity, G.I. Symptoms Liver damage.
25. Colistin Susp 20mg in 5 ml.	3–5 mg/kg/24 hrs.	

Antifungal		
26. Griseofulvin Tab 125mg	10mg/kg/24 hrs.	Hepatic, renal and hematological functions should be monitored
27. Mycostatin Tab 5 lac units	4 lac/24 hrs in newborns 1-2 million units in four doses	
Antitubercular		
28. P.A.S. Tab 0.5 gm Granules 2gm/measure	200mg/kg/24 hrs.	G.I. symptoms, goitre, hypothyroidism
29. I.N.H. Tab 50, 100, 300mg Syrup 50mg/5ml.	Chemoprophylaxis : 10mg/kg/24 hrs. 20–30mg/kg/24 hrs.	Hepatitis, neuropathies, aplasia pyridoxine deficiency
Sulphur		
30. Sulphathazine Tab 500mg.	150mg/kg/24 hrs-in four doses	Hypersensitivity, renal, hepatic haematological damage Steven Johnson Syndrome crystaluria

NAME	DOSAGE, ROUTES	CONTRAINDICATIONS
31. Septran		
Tab T.M.P. 80mg	not recomended	Hypersensitivity
Ped. Tab, Susp-half above dose	below 12 yrs. Adults 4 tabs daily	
Other chemotherapeutics		
32. Furazoldine		
Tab 50, 100mg	6mg/kg/24 hrs.	G.I. Symptoms Contraindicated below 1 month age, G 6 PD.
33. Nitrofurantion	13–6mg/kg/24 hrs	G. I. Symptoms, hypersensitivity
Tab. 50, 100 mg.		Contraindicated in newborn,
Susp 25mg/5ml.		G6PD, Anuria.
Anticoagulants		
34. Heparin Sodium		
in thousands of units	Initial dose : 50units/kg;	Bleeding, shock and hyper
Amp Vial 1, 5	maintenance:100 units/kg every four hours/to yield clotting time 2–3 times pre-heparin value	sensitivity
Antidote protamine Sulphate	1 mg for each 120 units of heparin in the last four hours (I. V. in drip)	

Anticonvulsants

35, Phenobarbiturate Tab 15, 30, 60, 100 Inj. 100mg/ml.	Sedation : 2mg/kg/24h. Antidonvulsant:3mg/kg/24hrs.	Contraindicated : Severe hepatic or renal dysfunction, porphyria, hypersensitivity.
36. Dilantin Sodium Cap 100, 250mg Elixir 100mg/5ml.	3–8mg/kg/22hrs.	Pancytopenia, nystagmus, ataxia rash, hypertrophy of gums, megaloblastemia and lymphadenopathy.
37. Ethosuximide Cap 240 mg.	under 6 years 1 cap above 6 years 2 caps, increase yb cap/week, if necessary	may increase Grandmal seizures in mixed type of seizures

Antidotes

38. Nalorphine Inj. 1 mg/ml. 10mg/ml.	0.1 mg/kg/repeat in 15 minutes if necessary	

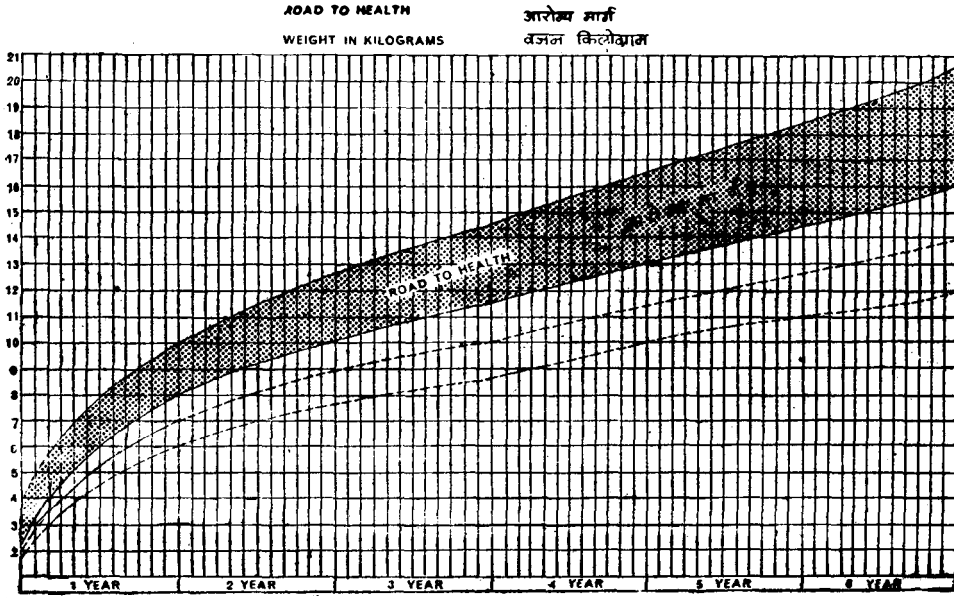
NAME	DOSAGE, ROUTES	CONTRAINDICATIONS
Antihistaminies		
39. Chlorpheniramine Maleate Tab 4 mg. Elixir 2.5mg/5ml.	0.35 mg/kg/24hrs in four doses	G.I. Symptoms, autonomic imbalance, blood dyscrasias, sedation
40. Benadryl Diphenhyramine Elixir 12.5mg/4ml. Cap 25, 50mg.	5 g/kg/24hrs-in four doses	
Antiprotozoam		
41. Chloroquine Tab 250, 500 mg.	See treatment of Malaria under P.U.O. Systemic infections :	Headache, pruritis, neurological dysfunction.
Antitussive		
42. Codeine	1mg/kg/24 hrs 3mg/kg/24hrs(analgeslic)	Habit forming
Bronchodilators		
43. Aminophylline Tab 100, 200mg. 250mg/ml-Inj.	12mg/kg/24hrs.	

44. Pseudorphedrine	4mg/kg/24 hrs.	Contraindicated : Hypertension.
45. Theophylline Tab 100, 200mg.	10–15mg/kg/24hrs.	Caution-peptic ulcer, cardiac, renal, hepatic toxicity, haemtemisis, irritability, convulsions coma.
Calcium		
46. Calcium Gluconate Tab 0.5, 1mg Inj. 100 mg/ml/(10%I.V.)	0.5mg/kg/24hrs-oral I.V. diluted, slowly, not more than 200mg/kg.	Bradycardia, local necrosis
Antihypertensive		
47. Guanethedine Sulphate Tab 10, 24 mg.	0.2mg/kg/24 hrs.	Sympatheiic blockage Caution in renal disease heart failure
47. Methyldopa Tab 250mg. 50mg/ml/Inj.	Orally 10 mg./kg./24 h. I.V. (Crisis) 20–40 mg/kg/24hrs. divide in four doses	Contraindicated:Active hepatic disease Caution : C.V.S. Insufficiency Toxic : G. I. symptoms. Nasal stuffiness, hematological

NAME	DOSAGE, ROUTES	CONTRAINDICATIONS
49. Reserpine		
Tab 0.25mg.	0.07 mg/kg/dose	Contraindicated : Hypersensitivity, mental depression Toxic Postural hypotension, arrythmia G. I. symptoms.
50. Digoxin		
Tab 0.25mg. 0.625 mg. Elixir 0.05mg/ml. Amp 0.25mg/ml.	See treatment cardiac failure	Caution Myocarditis, electrolyte imbalance
Cholinergics Blocking Agents		
51. Atropine Sulphate		
Tab Inj.	S.C. 0.01mg/kg/dose, repeat every 4–6 hrs.	
Diuretics		
52. Chlorthiazide		
Tab 250, 500mg	20mg/kg/2 hrs	Caution : Hypokalemia Contraindicated : Anurea
53. Furosemide		
Tab 4mg Inj. 10 mg/ml.	No dose of safety has been established in children	Use with caution in Children

54. Manitol Sol. 20%	2mg/kg/in 4–6 hrs.	Circulatory overload, electrolyte imbalance
Endocrines		
55. Cortisone Acetate Tab 5, 10, 25mg.	2.5–10mg/kg/24 hrs. replacement : 0.7mg/kg/24 hrs.	Contraindicated : Peptic ulcer serious bacterial fungal disease and active tuberculosis without proper antibiotic caverage
56. Dexamethasone Tab 0.5 mg.	1/30th of Cortisone dose	
57. Hydrocortisone Tab 5,10, 20mg. Vial 50, 100mg.	4/5th of Cortisone dose	
58. Prednisolone		
59. Levo Thyroxine Tab 0.1, 0.5mg	0.006mg/kg/24 hrs	Contraindicated : Hypertension, hepatic & renal disorders.
Iron Salts		
60. Ferrous Sulphate Tab 60mg of elemental iron	Elemental iron : 6mg/kg/24hrs. (therapeutic)	

NAME	DOSAGE, ROUTES	CONTRAINDICATIONS
Laxative		
61. Magnessium Sulphate Sol 25, 50% Crystals	Cathartic : 0.25mg/kg/dose	
Sedatives and Hypnotics		
62. Chloral Hydrate	hypnotic : 50mg/kg/24h. sedative:half above dose	Contraindicated : Severe hepatic. renal heart disease.
63. Paraldheyde Amp 2, 5, 10 ml.	0.15ml/kg/dose I.M.	Avoid in hepatic and pulmi-nary disease Use glass syringe discard bottle open more than 24hrs.
Tranquilizers		
64. Chlorpromazine Tab 10, 50, 100, 200mg	2mg/kg/24 hrs.	Extrapyramidal symptoms
65. Diazepan Tab 5, 10mg. Sol 5mg/ml.	Orally : 0.12-0.8mg/kg/ 24 hrs. I.M. or I.V.: 0.04-0.2/mg/	Cardiac or respiratoy arrest
66. Vitamin K Amp 10 mg. Tab.	Prophylaxis : 1 mg. I.M. Treatment : 5-10mg.	Hypotension; pain and swelling at injection site, hyperesen-sitivity, hyperbilirubinemia.


ROAD TO HEALTH
WEIGHT IN KILOGRAMS
आरोग्य मार्ग
वजन किलोग्राम
21
20
19
18
17
16
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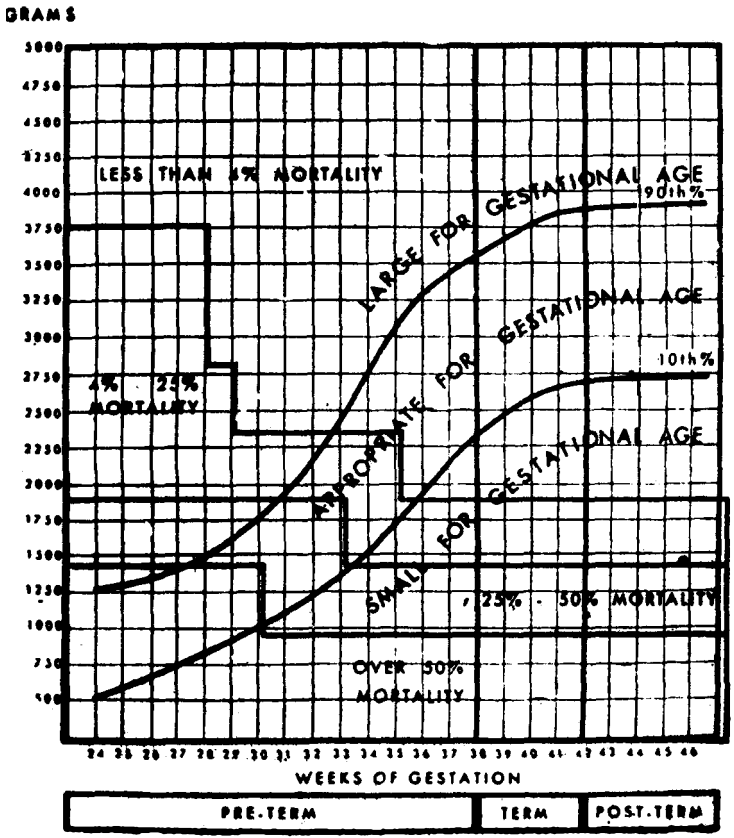
4
3
2
ROAD TO HEALTH
1 YEAR
2 YEAR
3 YEAR
4 YEAR
5 YEAR
6 YEAR

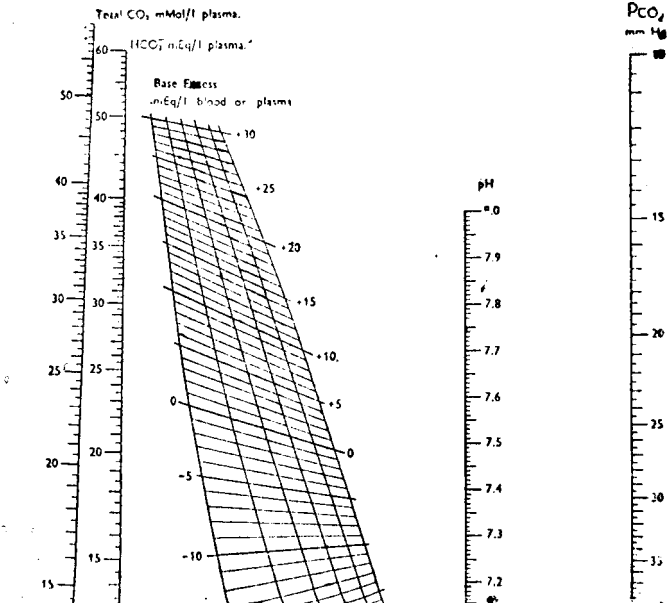
GESTATIONAL AGE

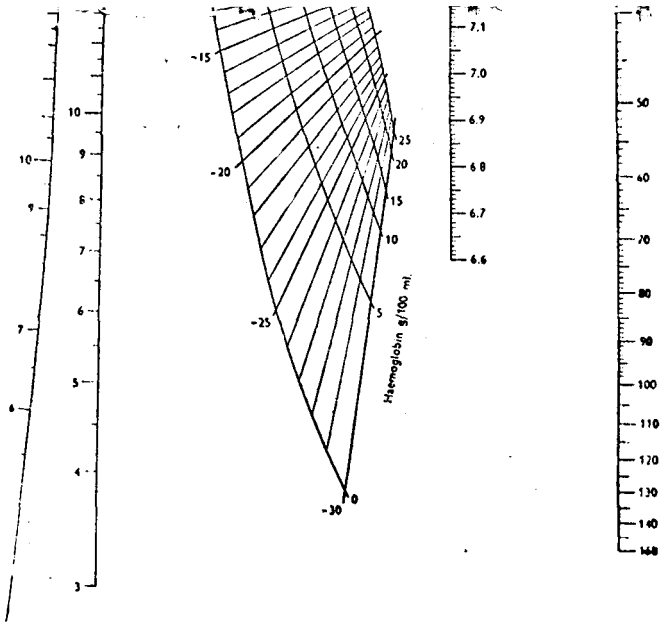
NAME OF PATIENT _____ BIRTH DATE _____

DOCTOR _____ NURSERY _____



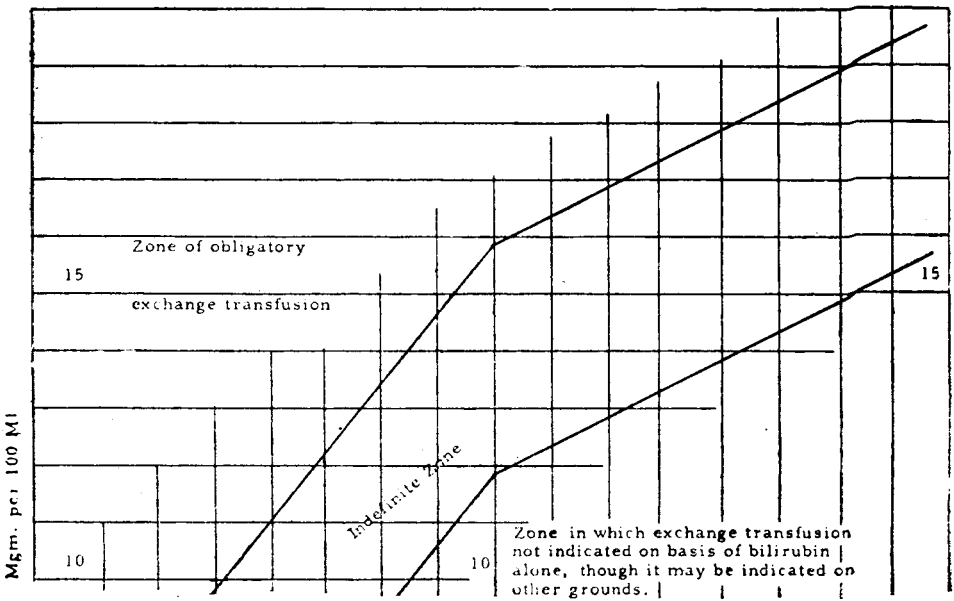
ACID BASE

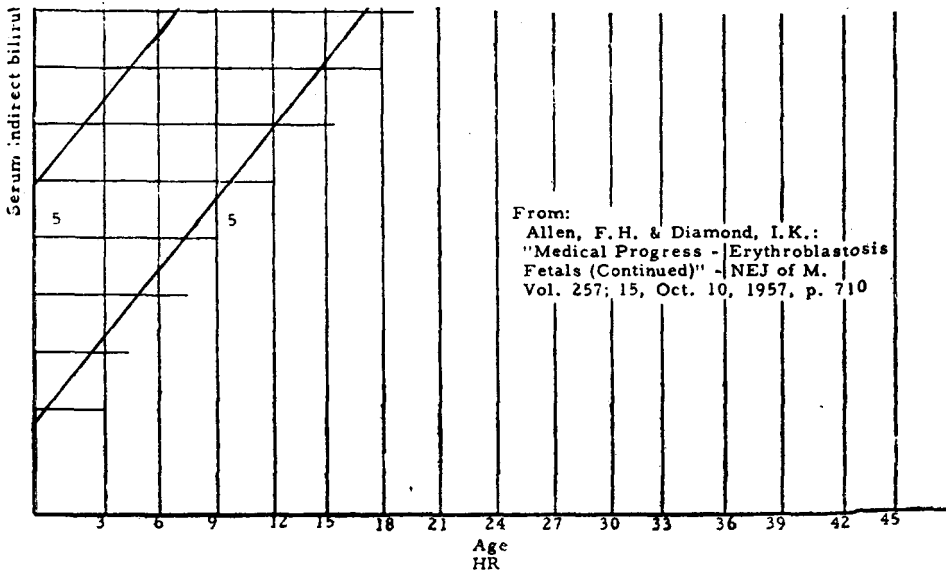

Total CO_2 mMol/l plasma.
HCO_3^- mEq/l plasma.
Base Excess
mEq/l blood or plasma
+10
+25
+20
+15
+10
+5
0
-5
-10
pH
7.9
7.8
7.7
7.6
7.5
7.4
7.3
7.2
P_{CO_2}
mm Hg
15
20
25
30



Siggoard—Anderson Nomogram

INDICATIONS FOR EXCHANGE TRANSFUSION



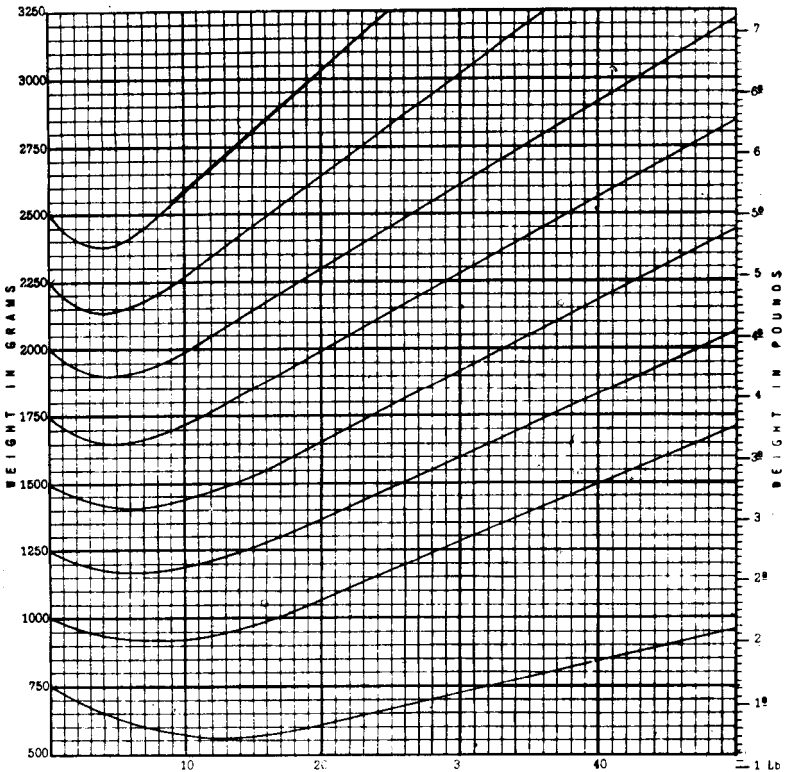


From:
Allen, F. H. & Diamond, I. K.:
"Medical Progress - Erythroblastosis Fetalis (Continued)" - NEJ of M.
Vol. 257; 15, Oct. 10, 1957, p. 710

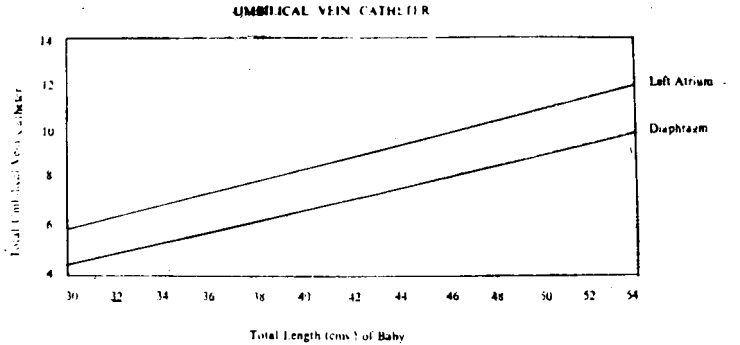
FORM- 285

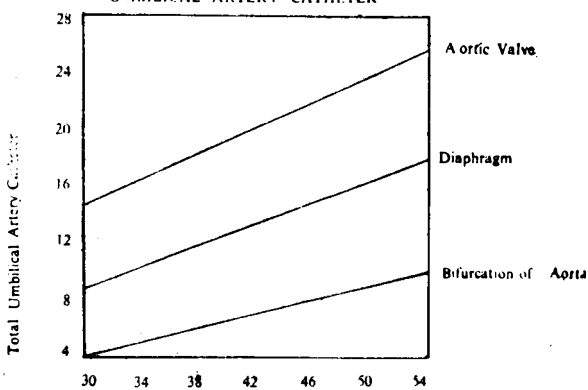
PREMATURE WEIGHT CHART

NAME_____ HISTORY NO._____



Form #535





E. F.—Archives of Disease in childhood. Vol. 41, 69. 1966